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NONCONTINUOUS MOTHERING IN INFANCY AND DEVELOPMENT IN LATER CHILDHOOD¹

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and LEE G. BURCHINAL
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On the strength of assertions which have been made about the effects of inadequate mothering, it might be hypothesized that, if maternal deprivation does occur, the children who experience it should reveal the results of that inadequacy in discriminable variations in personality structure and content. In the absence of such observable, discriminable variations in personality, any assumption of maternal deprivation seems unwarranted, regardless of the fact that unusual mothering conditions may actually have occurred.

In an earlier report (5) a research design was described, the central objective of which was to ascertain both short-term and long-range effects on children of an unusual, noncontinuous mothering experience during infancy. The major condition of that unusual mothering experience was residence in a home management house on a university campus, prior to being placed in private adoptive homes. During the period of residence in the home management house, each infant's care was provided by many different mother figures, each having responsibility for the baby for a few days at a time.

At the same time as the longitudinal study of these subjects has been going on, efforts have been made to locate children who resided in the home management houses over the past few years and to evaluate their present status in comparison with children who did not experience such an unusual mothering situation in infancy. One purpose for including this group of subjects in the over-all study is to make more meaningful any findings

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obtained with the younger, longitudinal group. In general, the condition of older children who were exposed, as infants, to such unusual mothering should help us to formulate clearer and more significant hypotheses about the future development of the larger group under investigation.

The purpose of this report, then, is to present information on a smaller group of older children who lived for a period of time during infancy in a home management house and who were subsequently adopted into private homes.

PROCEDURE

The subjects for investigation were selected through the cooperation of the Iowa Children's Home Society. That agency was responsible for the adoption proceedings for each home management house baby at Iowa State University since 1940. Their records indicated that there were 62 children who had lived in a home management house and had subsequently been adopted into families in Iowa.

Of that number, however, only 29 were still residing in Iowa and available for the investigation. Their ages ranged from 8 to 17, and their school grade placement from third through twelfth. Data summarizing the experiences of these children prior to being adopted are presented in Table 1.

TABLE I
PREADOPTION DATA ON HOME MANAGEMENT HOUSE SUBJECTS

	Mean	SD	Range
Age on admission to H. M. H.*	5.0	3.1	0.5-14.0
Length of residence at H. M. H.	5.1	3.1	0.8-12.0
Age at adoption†	12.1	5.6	3.0-23.0
Number of changes in residence	3.4	1.4	1.0- 7.0

* Age data reported in months.

† Refers to age at which child was first placed in adoptive family.

A group of comparison subjects were selected on a matched-pair basis. That is, a child of the same age and sex who had lived with his own biological family from birth was matched with each adopted child.² The matching procedure was carried out in the following manner:

All children in the school class in which the group A child was located were given the Otis Mental Ability Test and were asked to complete a family data sheet. This data sheet provided information about parents' ages, education, occupation, and number of children in the family. In addition, the

² For convenience in the discussion which follows, children who had lived in a home management house and, subsequently, in an adoptive family, are designated group A; those who had lived only in their own biological families are referred to as group B.

children completed items from the Gough Social Status Inventory (3), an index of socioeconomic status.

From the classmates of each group A child, between one and three potential group B children were selected. Factors considered in this selection were: sex, age, Otis IQ, family socioeconomic status, age of parents, parents' educational level, and father's occupation. The families of all children were intact and living together. Because of the selection procedure, each group B child was from the same community, grade level, and class as his mate in group A.

Inasmuch as no one "B" child could represent a perfect match with respect to all of the criteria, the final selection was made by a panel of three judges, working together, who agreed on the one "B" subject who most closely approximated the "A" child when all factors were considered.

TABLE 2
PARTIAL RESULTS OF MATCHING PROCEDURE

Matching Variable	N	Z	p
Otis IQ	29	1.93	.052
Age of children	27	1.22	.222
Age of father	25	3.49	< .001
Age of mother	25	4.07	< .001
Economic status	29	2.62	< .01

Table 2 reveals, in part, the extent to which this matching procedure was successful. Variables for which continuous data were available are listed in the left-hand column. The Wilcoxon matched-pairs signed-ranks test (7) was used to determine whether significant differences remained between the pairs of children. In this nonparametric technique, *N* refers to the number of pairs in which differences occurred. The *Z* score is based on standard deviation scoring units. Probabilities of differences as great as those observed between pairs are shown in the last column.

With respect to sex, the matching was perfect; hence, no test was made. With respect to age, the differences were insignificant. With respect to age of fathers and age of mothers, there were highly significant differences between pairs. Although average scores for groups are not pertinent to the Wilcoxon procedure, they are of interest in interpreting the differences found between pairs. The mean age of fathers in group A (48.4) was considerably higher than that for fathers in group B (41.1). Similarly for mothers, the mean age in group A (45.3) exceeded that for group B (37.7).

Differences between pairs with respect to socioeconomic status favored the adopted children. The absolute differences were small, but consistent enough to be highly reliable.

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In spite of the careful efforts to match the pairs on the basis of intelligence, the data in Table 2 indicate that there may be some question about their comparability. The p value of .052 approaches the 5 per cent level, which had been arbitrarily established in advance as the criterion for rejecting the null hypothesis. The mean scores favor the group B children (108.3) over group A (105.6). The differences are certainly not large, and it seems unlikely that such small differences in performance on the Otis examination would be of great significance. We are evidently dealing with the same general range of intellectual functioning for both groups. Thus, it was concluded that the matching procedure had been at least relatively successful with respect to intelligence.

The remaining matching variables included number of children in the family, educational level of fathers and mothers, and father's occupational classification. The occupational classification was based on the six major categories described by North and Hatt (4): (a) professional, (b) proprietary, (c) clerical, (d) craftsmen, (e) operatives, and (f) farmers. Of the 29 pairs, 13 were in agreement with respect to occupational groups. For eight additional pairs, the occupational group of the "B" father was in the next higher or lower classification, adjacent to that of the "A" father. In the remaining eight pairs the two fathers were separated by one or more occupational categories. All of the six occupational categories were represented in both groups, and there was no tendency for one group to rank higher than the other.

Comparison of educational level of parents was accomplished by establishing three broad educational categories: (a) completion of grade school only, (b) completion of high school, and (c) completion of college. Of the 29 pairs, there were 16 agreements and 13 disagreements for fathers, and there were 13 agreements and 16 disagreements for mothers. However, when the subjects were considered as groups rather than as pairs, the proportions in each of the three categories were almost identical, both for fathers and for mothers.

With respect to number of children in the family, the difficulty of maintaining absolute control in matching became even more apparent. Since the "A" children were all adopted and since it is unusual for parents to adopt more than one or two children, it might be expected that important discrepancies would be found here. Nevertheless, of the 29 pairs, 16 were in agreement on the number of children in the family. Another 10 pairs had only one more child in the "B" than in the "A" family, and in just three pairs was there a difference of two in the number of children.

To summarize the results of the matching procedure, the pairs of subjects were perfectly matched with respect to age, sex, educational level, community, and criterion of living in a complete (unbroken) family. Matching on the basis of intelligence was at least relatively successful; although differences between pairs approaching a level of significance were observed, in favor of group B, the average difference between pairs was so small as to

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warrant the conclusion that we were dealing with the same range of intellectual functioning. Matching of the pairs was less perfect with respect to the factors of size of family, educational level of parents, socioeconomic status of family, father's occupation, and age of parents.

In addition to the forms and tests described above, the subjects completed a number of procedures designed to get at some aspects of personality and adjustment. These tests included the California Test of Personality, the Children's Form of the Manifest Anxiety Scale, and the Rosenzweig Picture-Frustration Study. In addition, data were available for 18 of the pairs for the Iowa Every-Pupil Test of Basic Skills, a widely used test of general school achievement.

With the exception of the Rosenzweig P-F Study, which was administered individually, the tests were given in the classroom group, with all children participating. Thus, the subjects were not aware of the special nature of our interests. All of the tests, excepting the achievement tests, were administered by one of the authors.

Statistical comparisons of the 29 pairs were made with respect to the variables measured by these tests, and the results are presented in the following section.

RESULTS

Subjects were compared in the three major scoring categories of the California Test of Personality: Personal Adjustment, Social Adjustment, and Total Adjustment, the latter representing a favorable balance of elements of the other two. Results, shown in Table 3, indicate that there were no significant differences between pairs in any of these scores. These figures are based on the Wilcoxon procedure, previously described. It will be noted, however, that in the case of the Personal Adjustment scores, the *Z* value

TABLE 3

SIGNIFICANCE OF DIFFERENCES BETWEEN PAIRS: DEPENDENT VARIABLES

Variable	N	Z	p
<i>California Test of Personality</i>			
Personal Adjustment	28	1.81	.07
Social Adjustment	28	1.39	.16
Total Adjustment	27	1.55	.12
<i>Children's Form, Manifest Anxiety Scale</i>			
Anxiety Score	28	.06	.95
"L" Score	28	.41	.68
<i>Iowa Every-Pupil Test of Basic Skills</i>			
Composite Score	18	.20	.84

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of 1.81 and corresponding p value of .07 approach the 5 per cent probability level.

The differences favor group B, whose mean score was 60, in comparison with group A, whose mean score was 56. While the statistics do not allow us to reject the null hypothesis, it should be remembered that criteria for rejection, in this case, the .05 level, are always arbitrarily established. Thus, on the basis of this one finding alone, the possibility of there being real differences in personal adjustment between the two groups should not be overlooked.

For the Children's Form of the Manifest Anxiety Scale, no differences attributable to experiences of the group A subjects were observed. This scale provides an index of the level of anxiety of the subject and also an "L" score which indicates the tendency of the subject to falsify his responses to the anxiety items in the scale.

In school achievement, complete test data were available for only 18 of the pairs. For this small group, the test was not analyzed by subscores. When the composite scores were compared, no differences were observed between pairs.

Protocols for the Rosenzweig P-F Study were analyzed along somewhat different lines, since the primary justification for use of this instrument was to enable us to get at larger, more complex units of personality than could easily be subjected to a relatively simple numerical scoring. It was also desirable to have the initial scoring and analysis of the subjects' records done by someone not involved in nor familiar with the matched pair arrangement. For this reason, the Rosenzweig protocols were submitted to an independent consulting psychologist,⁸ particularly trained in the use of this instrument, for scoring and analysis. The consultant prepared a scoring summary and a brief written report of each subject's tendencies in response to frustration situations.

The written summaries were next presented to the consulting psychologist in pairs, without identification, and she was asked to rate each pair with respect to which child's record revealed a more "mature," more "integrated," or more "healthy" response to frustration situations. Of the 29 pairs, 12 of the ratings favored group A children, while 17 favored those in group B.

Under the null hypothesis, we would predict that half of the ratings would favor each group. A simple sign test was used to determine the probability of variations as large as those observed. Since we did not predict the direction of differences, a two-tailed test of significance was in order. The probability of variations as great as those observed was found to be .45; thus, there was no basis for rejection of the null hypothesis.

A more detailed analytical approach to the Rosenzweig scoring summaries was next undertaken in an effort to ascertain whether the written

⁸ We should like to express grateful appreciation to Janet Hirsch for her cooperation and assistance in this study.

reports, necessarily brief and somewhat general, were masking real differences between pairs. Such differences might take the form of specific variations in one or more of the nine scoring factors described in detail by Rosenzweig (6). Briefly, the protocol is scored for each of three directions in which aggressive reactions are made (extrapunitive, intrapunitive, and impunitive) and for each of three types of reaction (obstacle-dominant, ego-defensive, and need-persistent). It is the possible combinations of reaction types with directions of aggression which results in the nine possible scoring factors.

The form of our data, with protocols available on a matched-pair basis, suggested the possibility of a kind of analysis which would allow us to examine the interaction effects of groups, reaction types, and directions of aggression simultaneously. The basic question we sought to answer through such an analysis was, of course, whether reaction types and direction of aggression are in any way affected by variation between the two groups of subjects.

A form of the chi square technique was employed for this analysis, results of which are summarized in Table 4. In that table, "Rows" refers to the three directions of aggression, "Columns" refers to the three reaction types, and "Groups" refers to the groups of subjects. It may be inferred from the table that neither the reaction type nor the direction of aggression was in any way affected by the presence of the two groups on a matched-pair basis.

TABLE 4
SUMMARY OF ANALYSIS OF ROSENZWEIG PICTURE-FRUSTRATION
STUDY PROTOCOLS

Variable Combinations*	χ^2	df	p
Rows \times Groups	3.96	2	$\approx .15$
Columns \times Groups	1.64	2	$\approx .45$
Rows \times Columns	91.35	4	$< .001$
Rows \times Columns \times Groups	4.43	4	$\approx .35$
Total	101.38	12	

* In the computation of chi square, "Rows" refers to the three directions of aggression (extrapunitive, intrapunitive, impunitive); "Columns" refers to the three reaction types (obstacle-dominance, ego-defense, need persistent); and "Groups" refers to the two groups of children.

An interesting sidelight is the highly significant dependence of direction of aggression and reaction type (Rows \times Columns) on each other. In general, this dependence seemed to have the form of relatively more impunitive behavior on the part of the obstacle-dominant reaction type, with relatively more extrapunitive behavior on the part of the ego-defensive and need-persistent reaction types. This finding was not pursued, however, since our

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major concern was with the groups of children both of which showed such trends in about equal degree.

Another type of rating is also obtained on the Rosenzweig data. It is called the "Group Conformity Rating" and indicates the tendency to give more or less popular responses to frustration situations. There were no differences between the two groups with respect to that rating.

DISCUSSION

In this study, scores in the tests of achievement and personality generally favored the control children. In only one case, the Personal Adjustment score of the California Test of Personality, did the difference approach the .05 probability criterion. It would be hazardous to try to explain this only or even largely on the basis of the "experimental" variables. It is conceivable that scores in the California test are in some way associated with one or more, or a combination of, the matching variables in which we achieved limited success. It would be of more than theoretical interest in the professional field of adoption work to determine, for example, the effects of age of adoptive parents on the personality development of children.

For purposes of this presentation, the "unusual mothering conditions" described at the outset could be assumed to include the early discontinuities associated with being placed in a home management house, being cared for there by from 20 to 30 mother figures for a period averaging over five months, then being placed briefly in a foster home, and finally being adopted into a private family. In addition, however, it seems reasonable to assume some further discontinuities in the over-all development of a sense of personal identity, based on the fact of adoption *per se*. One of the obvious limitations of this study is that it does not differentiate between these two types of discontinuities.

For practical purposes at the moment, this may be a somewhat academic question since it has not been demonstrated that real influences on personality are associated with the complex of experiences in the home management house and later adoption. However, the type of control exercised in this study, where no major differences were found to exist, leads us to question whether the same thing would hold true had control subjects been selected during infancy. Presumably, if there are basically distorting or handicapping effects resulting from maternal deprivation, these might well manifest themselves in some of the very things which were used here as criteria for selection of comparison subjects. The most pertinent of these factors, probably, is intelligence. It might be argued that the procedure we have followed, since it meant selecting subjects for comparison whose intelligence was limited to the same level of functioning as that of the respective partner in the adoptive group, might have had an important leveling effect on other aspects of personality, such as those measured by the California Test of Personality, the Manifest Anxiety Scale, and the Rosenzweig P-F Study.

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It would seem that the only real answer to that question would have to come from longitudinal studies beginning with the facts of discontinuities in infancy, following subjects over significant periods of development and making comparisons at critical stages with control subjects. One such study (5) is currently in progress.

SUMMARY

Maternal deprivation in infancy should reveal itself in discriminable variations in personality during later childhood, as well as when the unusual mothering occurs. This study was concerned with the long-range effects of an unusual, noncontinuous mothering experience during infancy, a kind of mother-child relation which departs radically from the normal familial patterns of our culture for the first year of life. The problem is whether this constitutes a form of deprivation.

Subjects were 29 children, ages 8 to 17, who had lived in a college home management house during infancy and were subsequently adopted. In the home management house they had been cared for by a large number of mother figures, in serial fashion, experiencing a marked discontinuity in mother-child relations during the first year.

Subjects were paired with children from the same communities, attending the same schools and in the same classes. Pairs were also matched individually on sex, age, and intelligence. Matching for age and education level of parents, family economic level, occupation of father, and number of children in the family was only partially successful.

Subjects completed the California Test of Personality, the Children's Form of the Manifest Anxiety Scale, the Rosenzweig P-F Study, and Iowa Every-Pupil Test of Basic Skills. Statistical comparisons were made, in keeping with the matched-pair design.

The Personal Adjustment score in the California test favored the children who had not been subjected to unusual mothering. Statistically, the difference approached significance. However, this trend was not supported by other findings.

In selecting the tests used, attempts were made to focus on a variety of dimensions of personality processes: school achievement, personal and social adjustment, anxiety level, and response to frustration. In none of these variables could differences be attributed to the factor of discontinuity of mothering in early childhood.

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LATENCY OF SOCIOMETRIC CHOICE AMONG PRESCHOOL CHILDREN

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The investigation of peer relationships among young children provides one approach to the study of socialization. Marshall (4), in a review of sociometric research, concluded that the main body of the investigations failed to provide evidence for the usefulness of the reported sociometric techniques in predicting free play behavior among preschool children. Subsequently, McCandless and Marshall (3) developed a picture sociometric technique in which each *S* is presented with a board containing pictures of his preschool peers and asked to identify each. He is then asked to choose one child whom he best likes to play with, that child being designated his best friend. It was found that *S* choices correlated significantly with teacher best friend ratings and with actual free play behavior, thus offering evidence of the validity of the technique.

Providing an experimental validation of the picture sociometric, Horowitz (2) has demonstrated that a picture of a best friend has more incentive value than a picture of a neutral peer. In that study it was found that young preschool *Ss* (mean age 3-6) remained longer at a lever pulling task which revealed a picture of a best friend than did *Ss* whose lever pulling responses revealed a picture of a neutral peer.

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¹ The author is indebted to Dr. B. R. McCandless for his critical aid in the conduct of this study. The research was carried out at the Iowa Child Welfare Research Station of the State University of Iowa.

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When a best friend is defined as "a first choice in a sociometric task," the degree of the relation is left unqualified. Such a friendship may represent a strong and relatively constant relation, or it may indicate a weak relation characterized by occasional mutual activities and play periods.

The purpose of the present study was twofold: (a) to develop a technique based upon the picture sociometric which would yield a latency of response measure and (b) to investigate the relation between response latency and the relative strength of peer relations. It was felt that a latency measure would reflect the decision time involved in making a choice.

The hypothesis tested was that *Ss* rated as maintaining a strong or medium peer relation would exhibit shorter first choice latencies than *Ss* rated as maintaining a weak peer relation. Differential behavior as a function of age was also of interest.

METHOD

Apparatus

The sociometric task apparatus shown in Figure 1 contained 24 three-sided picture frames, each able to hold a 3 by 5 in. picture. A response button was placed below each frame. A Standard Electric Timer connected to the

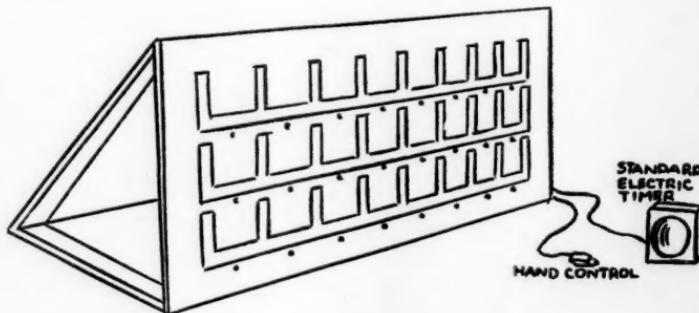


FIGURE 1—Sociometric task apparatus.

27 by 36 in. upright board and to *E*'s hand control button recorded the choice latency. Operation of the hand control button started the timer which was stopped when any of the response buttons was pushed.

A 15 by 19 in. miniature of the sociometric task apparatus containing four picture frames was used as a training task apparatus.

Subjects

Ss employed were enrolled in the younger (group I) and the older (group II) preschool groups of the Iowa Child Welfare Research Station

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Laboratory Preschool. They came from upper middle class families of the professional and managerial class.

Six of the 19 Ss in group I were discarded because their choices were made in order of row placement. The mean age of the 12 remaining Ss was 3-8, ranging from 3-2 to 4-0. Mean age of the 24 Ss in group II was 5-2, ranging from 4-8 to 5-6.

Procedure

Teacher ratings. Two teachers from each preschool group were asked to list for each child in their group the child's best friend. They were also asked to indicate the strength of the friendship; strong, medium, or weak, according to the definitions provided. In subsequent analyses the medium and strong categories were combined, since keeping them separate involved Ns too small for interpretation. (Hereafter, the strength categories will be referred to as weak and strong.) The teachers were also asked to list three additional friends for each S where possible.

Experimental procedure. Each S was taken individually from his preschool group to the experimental room by E to "play a game."² In order to train S to push a button rather than point at the pictures, a short training task preceded the sociometric task.

In the training task each S was shown the apparatus which contained four pictures of toys (doll, truck, tricycle, and easel painting set). After naming the pictured objects, S was told to listen to E's question and then answer it by pushing the button under the picture he chose. E said, "Push the button under the picture of the toy you like to play with best." At the conclusion of the question E started the timer which stopped when S pushed the button beneath his choice. E recorded the choice and latency. S was then asked to choose another picture. Then the pictures were changed and the procedure repeated. If S indicated his choice by pointing, E said, "Push the button to tell me your answer," and then waited until the correct response was made. At the end of the training task all Ss were using the buttons to indicate their choices.

The sociometric task immediately followed the training task. S was asked to push the button under each picture and to name the child pictured. E then said, "Push the button under the picture of the person you like to play with best." Three additional playmate choices were elicited in this manner, substituting the phrase "someone else you like to play with."

For half the Ss in each preschool group the pictures were presented in random order A. For the other half, the pictures were arranged in random order B, with the stipulation that a given child's picture did not appear in the corner position in both orders.

² Author served as E. She was not familiar with the teacher ratings until all Ss had been run.

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TABLE I
TEACHER RATING RELIABILITY AND TEACHER-SUBJECT
CHOICE COINCIDENCE

	RELIABILITY (r)		COINCIDENCE (%)	
	Best Friend	Strength	Weak Ss	Strong Ss
Group I .....	.28	.78*	58	46
Group II .....	.62*	.83*	27	61

* Significant at or below .05 level.

RESULTS

Teacher Ratings

The reliability of teacher ratings and the coincidence of teacher-subject choices are shown in Table 1. Strength of friendship was considered as an independent rating, on the assumption that the strength of the best friend relation, as rated by teachers, indicated *S*'s ability to establish associations with peers. The coincidence of teacher-subject choice was here considered without regard to relative order.

Table 2 indicates the percentage of coincidence between teacher and *S* choices, taking order into account. No analyses were performed on these data.

TABLE 2
COINCIDENCE OF TEACHER-SUBJECT CHOICES IN VARIOUS CATEGORIES

	GROUP I		GROUP II	
	Weak	Strong	Weak	Strong
<i>S</i> 's first choice same as teacher's first choice	0	43	40	56
Teacher's first choice same as one of <i>S</i> 's three other choices .	60	0	20	11

Sociometric Choice Latencies

The mean latencies of the first sociometric choices are shown in Table 3. No analysis of variance was performed on the data because the requirement of cell proportionality would have necessitated discarding too large a number of *Ss*. The value of *t* for each group was significant at the .08 level of confidence, though the direction of difference was opposite for the two groups.

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That is, *Ss* in group I rated as maintaining a weak peer relation tended to have longer first choice latencies than *Ss* rated as maintaining a strong peer relation. This tendency is reversed in group II.

TABLE 3
MEAN FIRST CHOICE LATENCY
(Time reported in seconds)

	W E A K		S T R O N G		<i>t</i>	<i>p</i>
	<i>N</i>	<i>Mean</i>	<i>N</i>	<i>Mean</i>		
Group I	5	5.97	7	3.78	1.84	.08
Group II	15	3.03	9	3.60	1.98	.08

The mean response latency for each *S*'s four choices was computed and a group mean calculated (see Table 4). In each case the value of *t* was significant at less than the .02 level of confidence, though the direction of difference in the two groups was opposite. The results, using mean response latency, thus paralleled those from the first choice latency analysis.

TABLE 4
MEAN LATENCY OF FOUR CHOICES
(Time reported in seconds)

	W E A K		S T R O N G		<i>t</i>	<i>p</i>
	<i>N</i>	<i>Mean</i>	<i>N</i>	<i>Mean</i>		
Group I	5	5.38	7	3.32	2.30	<.02
Group II	15	2.95	9	3.38	2.53	<.02

DISCUSSION

Technique

One purpose of the present study was the development of a technique for measuring the latency of a sociometric choice. When presented with a group of pictures and asked to make a choice, pointing is the dominant response among preschool *Ss*. Thus, to obtain a measure of first choice latency with a button pushing response, training was necessary. Since all *Ss* used the correct response mode on the first sociometric question, the training task seemed adequate.

For all groups first choice latency was longer than the mean latency of four choices, suggesting that, in the series of questions, either *Ss* became

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increasingly familiar with picture placement or learned to anticipate the questions, seeking their choices between and during questions. These factors may have differentially influenced *Ss* rated as strong and those rated as weak. If so, there remains to be explained why the influence should have been exerted in one direction for younger *Ss* and in the opposite direction for older *Ss*.

The technique seems useful, but the apparatus might be modified to include a standard hand rest for a starting position. Incorporating this feature might possibly reduce the variability of the data. However, the size of the board makes central placement of the hand rest difficult.

Teacher Ratings

In three of the four cases, the reliability of teacher ratings was low but significant, with best friend designations showing lower reliability than strength designations. However, strength ratings were not independent, since teachers rated the relation of the best friend and *S*. The assumption involved in considering strength ratings independently is that they were representative of the general intensity of peer relations *Ss* were able to establish. This assumption needs further investigation.

Validation of teacher friend designations is found in the percentage of teacher-subject choice coincidence (see Table 1). Low percentages would be expected in view of the low reliability for best friend designations. In addition, it would be expected that, given weak friendships, teachers would find it more difficult to list friends than in cases of strong friendships. It is interesting to note that the lowest percentage is found for group II weak rated *Ss*.

Choice Latency and Strength of Peer Relation

The main hypothesis was that *Ss* rated as maintaining a weak peer relation would exhibit a longer first choice latency than *Ss* rated as maintaining a medium or strong peer relation. The results indicated that the direction of the differences between the means for the two groups was opposite. The behavior of the younger *Ss* supported the hypothesis, while that of older *Ss* was contradictory. Thus, while weak rated *Ss* at the younger age level took longer to make their first choices, weak rated *Ss* at the older age level made their first choices more quickly.

Two factors might have operated to produce the results. Adults may encourage and reinforce strong peer relations, viewing the socialization of the child as a sign of normal development. As the child becomes more aware of the importance of peer relations, a lack of friends may be accompanied by an amount of anxiety. If the sociometric task elicited anxiety for older *Ss* rated as weak in a peer relation, and if anxiety heightens drive, a shorter first choice latency would be expected. More random choices might also result, as there would be less time to think and search out a particular picture. Older *Ss* rated as weak did have the lowest percentage of choice coinci-

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cidence with teacher choice (27 per cent). The results could also be due to the fact that older *Ss* rated as strong might have looked more carefully to find their best friends. Choices of strong rated older *Ss* showed the highest coincidence with teacher choice (61 per cent). Table 2 indicates that strong rated older *Ss* also had the highest percentage of coincidence of first choices with teacher best friend choices, providing some support for this latter explanation.

For the older child, given a greater number of friends, choosing one from among them is a more complex task than when there are a few strong friends since, in a sense, choosing one involves rejecting others. Hence, the approach-avoidance conflict is greater and response may be slowed for two reasons: complexity of task and intensity of conflict.⁸ This may lessen the pull of the best friend choice for the *S* who maintains strong friendships, yet interfere little with the choice of the *S* who maintains weak friendships. For the younger child, not aware of the implications of his choice, the hypothesis as tested is working.

Analysis of the mean latency for the four choices yielded results significant at the .02 level of confidence, paralleling the results for the first choice data. A mean latency might provide a more stable measure of each *S*'s latency, thus reducing group variability. Since it corroborated the findings for the first choice latency measure and seemed more stable, it might be the preferred response measure in this type of task.

The present study suggests some further investigations into peer relations using the modified picture sociometric technique described here. Of particular interest would be further study of the assumption that the weak or strong best friend relation represents *S*'s general ability to establish social relations with peers. Work in this area may provide further clues to the variables affecting the socialization process.

SUMMARY

For each child in two preschool groups teachers listed a best friend, rated the friendship as strong, medium or weak, and indicated three additional friends. Twelve younger and 24 older preschool *Ss* were then trained to push a button to indicate a picture choice and were asked to make four friend choices from a modified picture sociometric board. It was hypothesized that *Ss* rated as having a weak peer relation would exhibit longer first choice response latencies than *Ss* rated as having a medium or strong peer relation. Combining medium and strong rated *Ss*, the results supported the hypothesis in the case of younger *Ss*, but were antithetical for older *Ss*. Factors which might account for the results were discussed and the technique was evaluated.

⁸ If conflict generates anxiety, thus heightening drive, in this case it would be expected that the increased drive would be reflected in the vigor of the response rather than in an increase of random choices as was suggested for weak rated older *Ss* [see (1)].

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EFFECT OF HAND-MOUTH CONTACTING ON NEONATAL MOVEMENT^{1,2}

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Contact between the hand and the mouth in the infant has received considerable theoretical attention. The great frequency of occurrence of hand-mouth contact in infants and the continuation of the behavior in the finger-sucking of older children suggests that it is a response of some importance. The fact that this response is intimately related to vital consummatory acts suggesting the possibility that its elicitation or execution may involve some rewarding, relaxing, or "satisfying" effects.

Hoffer (3) has argued that the effectiveness of hand-mouth contact may be due to the fact that it produces a reduction in "tension," a theoretical construct related to "drive," as used, for example, by Hull (4), or "libido," as developed by Freud (2). Some of the behavior patterns found by Wolff (10) in his systematic observations of newborns indicate that such a theoretical formulation may be fruitful.

The general relation between hand-mouth contact and tension, i.e., the correlation between the two variables, that is implied by the theory is not clear. It would seem reasonable, however, that, if hand-mouth contact serves to reduce tension, an effect would be seen in close temporal proximity to the contact. It is expected that tension would be reduced after the infant has made a contact and that tension would rise again as time since the previous contact increases.

Both theoretical and empirical considerations suggest that activity level is a suitable empirical interpretation for the construct of tension. Restlessness is commonly considered to be an index of distress and tension (7, 9), and the theoretical formulations imply a positive relation between degree of tension and activity level. Empirical studies attest to the validity of such an assumption (8, 10).

The present study was conducted to provide evidence relevant to these issues by means of an analysis of the relation between hand-mouth contact

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and activity. It is possible that some mouthing behavior beyond mere stimulation of the mouth region by the hand might be required for a reduction of tension. Wolff (10), for example, suggests that hand-sucking and mouthing before meals may possibly serve to discharge "need tension." For this reason, an analysis of the effects of "long" contacts and of "short" contacts has been made separately.

METHOD

Subjects

The subjects were 10 healthy, full-term newborns, observed in the nursery of Grace - New Haven Hospital. Five were male, and five were female.

Apparatus

A 16-mm. motion picture camera with wide-angle lens was placed in a fixed position approximately 39 inches above the infant. An observer recorded frequency and duration of hand-mouth contacting on an Esterline-Angus operations recorder. The observer's silent telegraph keys also operated a signal light (shielded from the subject) which recorded on the film when a contact was judged.

Procedure

Each subject was observed at 11:00 A.M. on each of his first five days, just before his noon nursing period. The infant was placed on a covered foam rubber pad, dressed in diaper and shirt. A five-minute observation period was followed by five one-minute filmed observations, each one minute apart. In each observation the camera ran until it was completely unwound; thus, the first 30 to 40 seconds of a particular observation were filmed. Inter-observer reliability on recording frequency and duration of hand-mouth contact was .96. Two observers were always present; the second recorded other behavior, not analyzed in the present study. The entire 10 minutes of observation were completed without interruption.

Film Analysis

Observations 1, 3, 5 of days 1, 3, and 5 were analyzed for the present study. Only sessions in which at least one hand-mouth contact occurred were used; this included 85 per cent of the data. The technique has been reported in detail by Kessen, Hendry, and Leutzendorff (6). The present analysis is a modification which affords a measure of activity during any one-second period. For each session 15 frames of the 480 to 640 frames (30 to 40 seconds at 16 frames a second) on the film strip were selected by means of a table of random numbers; these 15 frames served as the beginning-points of the 15 one-second periods for which an activity measure was obtained. The

displacements of four standard points of the body from the beginning-point frame to the one 16 frames beyond (i.e., one second) were totaled to determine the activity level for that particular second. For each "activity point" the elapsed time from the last hand-mouth contact as well as the time from the next contact on the film were recorded. When a contact occurred at any point during the 16 frames included in an activity point, no measure was taken. Thus, all activity points obtained are before or after a contact, never during a contact. Inter-observer reliability on this task was .99.

RESULTS

A total of 890 "activity points" were scored; 369 of these fall at some point after a hand-mouth contact, and 461 fall at some point prior to a recorded contact. From inspection of the distribution of contact-duration scores, it was decided to set the arbitrary criterion of a "long" hand-mouth contact at 16 frames or one second duration. It seemed reasonable to assume that a contact of one second or longer was enough for an effect of mouthing to take place. The number of sample points falling into the long and the short categories is approximately equal, so that the sensitivity of the test for either category has not been impaired by this cut-off point.

Significant individual differences in activity were found (within-subject $MS = 5.63$; $df = 9$ and 479; $F = 22.14$; $p < .01$). The score used for each subject was the mean of all his activity scores during a period of eight seconds on either side of a contact; this included about 75 per cent of the data. Mean length of hand-mouth contact for each subject was computed by dividing his total duration of contact by the frequency of contact, totaled over all the observations for that infant. This measure was chosen rather than simple frequency or duration of contact because of the variable amount of film available for each infant. There were no significant differences between subjects. The correlation between mean length of contact and activity was $-.19$, not significant at conventional levels.

Because of the significant individual differences, the complete set of activity scores for each subject was transformed into standard scores in order to equate mean differences. Each score was arbitrarily increased by 4.0 to eliminate negative scores and to facilitate computation.

Analysis of variance showed a significant variation in activity over days: days 3 and 5 were not significantly different from each other; day 1 was significantly different from both days 3 and 5 ($t = 2.40$ and 2.72 , respectively).

To assess the effects of hand-mouth contact on activity level just before and just after contact, scatterplots were made of activity as a function of time from the nearest hand-mouth contact. In order to determine the degree of relation between activity and time from hand-mouth contact, Pearson r_s were computed. Since the present analysis clearly designates activity as the dependent variable and time from contact as the independent variable, the

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regression of activity on time from contact was also determined. The slope of the regression line indicates how great a change in activity accompanies a given change in time (1).

The statistical significance of an r and its corresponding regression line (b) are the same (1). For both long and short contacts, there was no significant relation between activity and time from hand-mouth contact in the case of time preceding contact. With respect to time following contact, rs of $-.16$ and $-.21$, and bs of $-.0018$ and $-.0020$, all significant at the 5 per cent level, were obtained for long and short contacts, respectively; that is, S 's activity decreases very slightly as the time since he last made a hand-mouth contact increases. On the basis of inspection of the scatter diagrams, no test was made of nonlinear trends in the data.

Because there was a significant day variation, however, these statistics were recomputed for days 3 and 5 only. None of the slopes or correlations was significant, when day 1 was omitted from the analysis, nor were any of the results for day 1 alone significant.

There was no significant difference between mean activity level during the first five seconds preceding contact and the first five seconds following contact, either for long contacts or for short ones; that is, activity was not lower just after contact than it was just before a contact. Also, when day 1, and days 3 and 5 were analyzed separately, there were no significant differences.

DISCUSSION

No over-all relation of hand-mouth contact and activity through the lying-in period was shown. This may be due to the fact that this study, not designed primarily to test the gross correlation between these measures, provides an insensitive test; however, it would appear that any effect, if present, is small. The finding that over-all activity level is lower on the infant's first day of life than on his third and fifth is in agreement with other studies concerning developmental changes in activity, as in (5), for example.

The results of the test of the effect more specific to the time of the contact were also not significant. There was no mean difference between activity level during the five seconds before a contact and during the five seconds following a contact, for long or short contacts. Five-second periods before and after contact were chosen because it was felt that any reduction in activity resulting from a hand-mouth contact would be greatest immediately following the contact.

Activity did not rise either as a function of time preceding the occurrence of a hand-mouth contact or as time passed following a contact. Rather, when the data of all three days are pooled, there is a small and significant decrease in activity as time following a contact increases. The fact that such small relations as were found reached significance suggests that this was

indeed an adequate test. However, the significance test of the r indicates only its reliability and not the magnitude of the relation between the two variables. A very small correlation based on a sample of large N often reaches statistical significance, even though for purposes of interpretation the effect is so small as to be trivial. Certainly for the purposes of the present analysis, the slopes of $-.0018$ and $-.0020$, even though reliable, are probably not psychologically meaningful.

One limitation on the present finding is that this study ignores the possibility that the only effective hand-mouth contact is, for example, five or six seconds long. This possibility was not considered because of the infrequent occurrence of contacts of such a length. Indeed, the proportion of contacts this long is so small that, if these were the only effective ones, it would seem likely that it was not the hand-mouth contacting alone, but an additional factor present during the longer contacts, that accounted for the variance in activity.

It is concluded that the results of the present study do not support the hypothesis that hand-mouth contact plays an important role in influencing newborn behavior and that, to the extent that activity is related to tension, the hypothesis that hand-mouth contacting functions as a tension-reducing mechanism is not confirmed.

SUMMARY

The relation between hand-mouth contacting and activity, measured by a film analysis technique, was studied in an investigation of the hypothesis that hand-mouth contacting is tension-reducing in the newborn. The present study utilized filmed observations of days 1, 3, and 5 of the lying-in period for 10 newborns.

No significant differences were found between mean activity level during the five seconds preceding a hand-mouth contact and that of the five-second period immediately following a contact. Regression of activity on time preceding a contact was not significantly different from zero. There was a significant but very small decrease (opposite in direction to expectation) in activity as time following a hand-mouth contact increased. When the data for day 1 were eliminated from the analysis, none of the relations was significant; nor were the results of an analysis of the day 1 data alone.

The implication and generality of these findings were discussed.

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SOCIOECONOMIC VERSUS FAMILY MEMBERSHIP STATUS AS SOURCES OF FAMILY ATTITUDE CONSENSUS

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Students of family behavior frequently assume that membership and interaction within one's family group contribute heavily to the shaping of an individual's attitudes, particularly on family-related issues such as the expression of love, companionship, and domestic authority. It seems reasonable to expect that membership in families with distinctive values, standards of conduct, and interaction patterns influences very materially the attitudes of offspring. It is equally plausible to assume that husbands and wives will tend, through extended interaction, toward agreement on family issues.

The aim of this study was to test empirically the extent to which family members do in fact share *common* family-related attitudes. Family membership may influence attitudes in ways that do not result in consensus among members. We assumed, however, that the consensus on salient issues is a satisfactory initial test of family influence and that family group consensus is a problem of interest in itself.

One approach to the problem of the relevance of the family as a source of common attitudes is to contrast the attitudes of family members taken as natural groups with the attitudes of the same individuals regrouped into similarly composed, yet artificially assorted, units. In seeking to learn whether family members had more in common with each other than with other families, the chief aim of our study was to contrast family membership with socioeconomic status.

HYPOTHESES

If families are influential in determining the attitudes of members on family-related issues, then it is reasonable to expect that between two groups (the one a natural kinship group, the other a randomly devised or artificial

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group composed of a father, mother, son and daughter—each drawn from a different kinship group) attitude consensus will be significantly greater within the family group.

Secondly, if the groups are matched by socioeconomic status, it seems equally reasonable to expect that the differences in amount of attitude consensus from status level to level will be greater between the natural families than between the artificial groups. This hypothesis involves testing a secondary assumption, namely that family-related attitudes are bound to vary by socioeconomic level, insofar as the family transmits that portion of the culture accessible to the social stratum and groups in which the parents find themselves. Thus, differences in amount of consensus between groups should be increased when both family and socioeconomic status are controlled.

PROCEDURE

Responses of husbands, wives, and their adolescent children to a battery of 10 questions in the Burgess Middle Years of Marriage Study served as the data for this research.¹ Seventy-five families with one or two adolescent children were selected for analysis.

The 75 families were assigned to three socioeconomic categories, henceforth termed classes, on the basis of the following criteria relating to husbands:

	<i>Number</i>	<i>Annual Income</i>	<i>Occupation</i>	<i>Education</i>
Class I . .	32	\$11,500 & over	Professional Executive	16 years & over
Class II . .	21	\$ 8,500 maximum	Lower managerial Clerical, sales	10-14 years
Class III . .	22	\$ 7,200 maximum	Skilled workers Service workers	12 years maximum

After assigning the families to a class, artificial three- and four-person groups were devised by assorting randomly the subjects within each class. No husband, wife, or adolescent child was sorted into a group containing another member from the same real family.

In the course of home interviews, each respondent had been asked in private to indicate his or her personal opinion of the importance of each of the following items for "the ideal marriage":²

¹ A follow-up study among the couples participating in the Ernest W. Burgess and Paul Walling research report, *Engagement and Marriage* (Lippincott, 1953). Support for portions of this research, including the present report, was given by the Rockefeller Foundation and the Grant Foundation.

² Five degrees of opinion were shown on the checklist, ranging from "Very necessary for a happy marriage" to "Decidedly not desirable."

Love

1. Husband and wife should frequently express their love for their children in words.
2. Husband and wife should frequently express their love for each other in words.

Companionship

3. Parents and children should be just like pals when doing things together.
4. Fathers should spend part of their free time on weekends with the children.
5. Husband and wife should like the same types of amusement (cards, dancing, theatre, etc.).
6. Husband and wife, if congenial, should take their vacations together.

Authority

7. The husband should "wear the pants."
8. The wife should have money of her own, or should earn her own living by paid employment, and not be financially dependent upon her husband.
9. Children should be held to a strict discipline.
10. Young people should be trained never to indulge in "petting" and "spooning."

Each of the three components of the 10-item battery contains items relating to interaction between husbands and wives and between parents and children. The four items in the "Authority" component were selected as an index of traditionalism in this area on the basis of the opinions of a panel of judges and an item analysis which showed these items to be reliable in discriminating between highly "traditionalistic" and extremely "modern" respondents.

Absolute differences in scores were computed on the items between all pairs of individuals. In the 75 families classified according to socioeconomic level, and in the artificial groups, a set of mean differences was computed. Thus, amounts of disagreement refer to total summed differences of pairs, within family and within random groups, on the battery of 10 questions.

RESULTS

Table 1 disconfirms both hypotheses. The first hypothesis, that consensus within natural families will be greater than consensus within artificial groups, is rejected. The difference is statistically not significant for the 75 families compared with the 75 artificial groups; the probability for the gross comparison indicates no more than chance difference ($p = .52$). Indeed, there is less consensus within class II families than in class II artificial groups. The second hypothesis, that interclass differences should be greater between classes for natural families, is also not supported.

More interesting is the positive finding that interclass differences, excluding class I versus class II, are significant at beyond the .02 level for

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TABLE I

COMPARISON OF MEANS OF DIFFERENCES BETWEEN INDIVIDUAL SCORES IN FAMILY AND RANDOM GROUPS BY SOCIOECONOMIC LEVEL

Socioeconomic Level	Family Group	Random Group	Critical Ratio (Family vs. Random)
INTRACLASS MEAN			
Class I	5.55	5.66	.53
Class II	5.63	5.52	.63
Class III	6.04	6.18	.70
INTERCLASS CRITICAL RATIO			
Classes I vs. II .....	.4	.6	
Classes I vs. III	2.4	2.5	
Classes II vs. III	2.3	3.3	

both natural families and artificial groups. These findings may be summarized as follows. While differences in amount of consensus are in part accounted for by socioeconomic status, family membership status accounts for none of the variance.

Apart from the hypotheses, Table 1 suggests that attitude consensus on family-related matters is very significantly affected by socioeconomic status. To investigate whether such attitudes might be considered more a function of socioeconomic status than a consequence of family membership, the 10-item attitude score of each family member was paired with that of every other member. Differences between paired scores were then averaged and tabulated as shown in Table 2.

TABLE 2

MEANS OF DIFFERENCES IN SCORES OF INDIVIDUALS IN PAIRS IN FAMILY GROUPS BY SOCIOECONOMIC LEVEL

Socioeconomic Level	Total (N=75)	Husband Wife	Father Son	Father Daughter	Mother Son	Mother Daughter	Child One Child Two
LOVE AND COMPANIONSHIP (6 items)							
Class I	4.5	3.3	4.6	4.4	5.1	4.9	5.2
Class II	4.8	3.2	5.1	4.9	5.0	5.2	6.3
Class III	5.3	3.8	5.9	5.6	5.7	5.6	6.1
AUTHORITY (4 items)							
Class I	4.0	4.2	4.2	5.9	3.9	5.4	4.7
Class II	4.5	5.1	3.9	3.9	4.6	5.1	4.3
Class III	5.0	4.5	5.2	4.9	4.9	5.0	5.8

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This approach allowed us to isolate age and sex role sources of attitude consensus, holding socioeconomic status constant. Means of differences within pairs are presented separately for Love and Companionship and for Authority, since means for the two groups of items differed significantly at the .001 level.

A Kruskal-Wallis analysis of variance, using the classified families, was calculated for each of the two scales. On Love and Companionship, the three classes differ significantly at beyond the .10 level. They do not differ significantly on Authority. Therefore, we shall concentrate on the pattern of differences on Love and Companionship.

The "Total" column in Table 2 shows that amount of over-all consensus between paired family members decreases as class level decreases. There is greater consensus within class I families than within class III, as Table 1 also showed.

The influence of socioeconomic status diminishes when family members are paired by age and sex, however.³ For example, husbands and wives reflect the highest level of consensus among all possible pairs, regardless of class. In contrast, the two offspring per family exhibit extremely low consensus, especially in class II and class III.

Cell variance is not significant on the Authority-related attitudes, yet what pattern occurs parallels the pattern characteristic of differences in consensus on Love and Companionship. For example, consensus decreases with decreasing socioeconomic status. Husbands and wives are more congruent than other pairs, with a few single cell contradictions. Paired adolescent children disagree rather highly, as on Love and Companionship, but the lowest consensus on Authority occurs for paired mothers and daughters. Interestingly, item analysis indicated that mother-daughter disagreement was accounted for by the more extreme conventionality or conservatism among daughters regarding authority.

DISCUSSION

Differences in the family-related attitudes of family members appear to be more readily accounted for in terms of socioeconomic status of the members and of differences in age and sex roles. Although the status classification used in this study involved placing all family members by the income, occupation, and education of one family member, the father, status differences are manifested as completely when members are artificially grouped as they are when family membership is considered.

The findings might be very different if young families with grade school children were used in place of middle-age parents with adolescent offspring. That is, one would expect the influence of groups (and statuses) external to the family to increase with time; and we have shown that the greatest

³ Differences between paired members on Love and Companionship is significant at below .10 ($\chi^2 = 9.86$, $df = 5$).

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source of disagreement is the children. Parents are relatively highly congruent, socioeconomic status notwithstanding.

Families doubtless transmit, mediate, and modify the attitudes of their members toward the desirability of expressions of love, companionship, and domestic authority. We would suggest that this process of transmission is so extremely "vulnerable" to the influences of socioeconomic status, age status, and sex role prescriptions, among other influences, that future studies of parental attitudes and socialization should explore in greater detail the pressures against family consensus that are thereby generated. Further research should also explore the differential effects of ethnic, religious, and subcultural variations within, as well as among, family groups.

SUMMARY

Responses of parents and children in 75 families to a battery of 10 attitude questions concerning expression of love, companionship, and authority, which were included in the Burgess Middle Years of Marriage Study, were analyzed. Two hypotheses were tested: (a) attitude agreement would be greater in natural families than in artificially composed groups; and (b) class differences, using an index of socioeconomic status, would be greater between families than between artificial groups.

The families were categorized by father's income, occupation, and education into three classes. Artificial groups were devised by random sorting of individuals into three- and four-person groups containing husband, wife, and children, with each drawn from a different family.

Differences between the scores of paired individuals were summed for each family and each artificial group. A test of significant differences using socioeconomic class means and variances of amounts of difference required rejection of both hypotheses. Family groups did not show significantly greater amounts of agreement than artificial groups as a whole or per class. Differences between socioeconomic classes were significant for both family groups and artificial groups, except between class I and class II.

Using mean differences between pairs for a secondary analysis, it was found that on Love and Companionship attitudes (a) consensus was greatest in class I and lowest in class III and the difference was significant at beyond the .10 level and (b) cross-sex and cross-age pairs differed significantly at beyond the .10 level in amounts of agreement. Husbands and wives were uniformly most congruent in their attitude responses.

Family-related attitudes were therefore viewed as affected differentially by determinants that are *not* unique to family membership status, namely socioeconomic status, age, and sex. It was acknowledged that younger families might exhibit less "vulnerability" to external structural effects.

PREDICTION OF OUTSTANDING PERFORMANCE, DELINQUENCY, AND EMOTIONAL DISTURBANCE FROM CHILDHOOD EVALUATIONS¹

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This study of special outcomes presents one way of evaluating the predictive effectiveness of pupil responses to inventories and of teacher's ratings in an eight-year study of children's adjustment in a rural county in southwestern Minnesota (1).

PROCEDURE

In 1950 a large number of tests were given to over three thousand school children in this county, all those from grade 4 through grade 12. Inventories to which the pupils responded covered family attitudes, social responsibility, social maturity, home chores performed, range of leisure time activities, pleasant-unpleasant orientation, and psychoneurotic symptoms. In addition, the teachers rated each pupil on 20 personality characteristics (Personality Profile) and on the Havighurst check list of responsible behaviors (Teacher Check List). On the basis of internal consistency, items from these measures were then selected to form a shorter instrument, the Adjustment Inventory. A new responsibility measure was developed from items of the 1950 measure of social responsibility and the Teacher Check List which discriminated between young people nominated as very responsible and others thought of as irresponsible. The sentence completion measure, the chores liked, and the Personality Profile were also shortened by including only items which had discriminated in an item analysis.

These revised measures, together with a new Family Attitude scale used by the University of Minnesota's Rural Sociology Department, were given

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in 1954 to all school children ($N = 3,500$) in grades 4 through 12 in the same county.

In 1958 all youngsters from this population who had become delinquent (146) and all who had received public recognition, special positions, or honors (136) were identified. In addition, social workers, school nurses, the probate judge, and the medical clinic provided the names of 18 young people, 13 girls and 5 boys, who had become emotionally disturbed.

RESULTS

The tentative base rates estimated from these referrals and nominations within the county are low. They are, however, based only on young people in their teens and early twenties. For outstanding performance, they are 32 per 1,000 for females, 28 per 1,000 for males. For delinquency based on the number of *individuals*, not on the number of offenses, they are 15 per 1,000 for females, 85 per 1,000 for males, 20 per 1,000 of these for repeated major delinquencies. For those diagnosed as emotionally disturbed, they are 6 per 1,000 for females and 2 per 1,000 for males. There are two reasons for the small size of the emotionally disturbed group: first, it was impossible to determine how many had sought help through a private physician and/or hospital outside the county; second, most of the young people in our study are still below the age at which severe emotional disorders and the major psychoses commonly have their onset.

The mean scores for each of the special groups on the predictor variables are shown in Table 1. They are stanines or standard scores which permit the comparison of a given youngster in a special group with the average for all pupils in the county of his age and sex. The population mean is 5, and the standard deviation, 2.

Both the outstanding boys and the outstanding girls are differentiated by the largest number of predictors. These young people scored significantly higher than their agemates on measures of intelligence and socioeconomic status, on Family Attitudes, Responsibility, Social Maturity, and the Adjustment Inventory. Their teachers rated them above the average on the Personality Profile and the Teacher Check List.

In contrast, boys and girls in the group who later encountered trouble were differentiated by fewer predictor variables. Those who were to become delinquents, both boys and girls, had significantly lower than average scores on measures of socioeconomic status and on the 1954 Responsibility measure. Delinquent boys had, in addition, below average ratings on *all* our teacher instruments and on the 1954 Adjustment Inventory. Boys with a record of repeated major delinquencies (rape, burglary, bodily assault with knife, etc.) had considerably lower scores on more predictors than the other delinquent groups. The teachers' evaluations of the girls who became delinquent, though low, were not significant for this size sample. These girls, however, did score significantly lower on the 1950 Family measure describ-

TABLE I

MEAN STANINE SCORES OF OUTSTANDING, DELINQUENT, AND
EMOTIONALLY DISTURBED GROUPS ON PREDICTOR VARIABLES
(Means of all members of sample = 5)

Predictor Measures	OUTSTANDING		DELINQUENT		EMOTIONALLY DISTURBED
	Boys	Girls	Boys	Girls	Girls
IQ (1950)	6.9*	7.2*	5.2	5.3	4.7
<i>SES Measures</i>					
Sewell (1950 SES)	6.7*	6.7*	4.2*	4.3	4.0*
Personal Data (1954 SES) ..	7.3*	7.1*	4.1*	3.3*	4.5
Father's Education	6.6*	6.2*	5.1	3.9*	4.9
Mother's Education	6.6*	6.6*	4.9	3.9*	5.0
<i>Teacher Ratings</i>					
Personality Profile (1950) ...	5.9*	5.9*	3.8*	4.4	3.9*
Teacher Check List (1950) ..	5.8*	6.0*	4.0*	4.2	5.0
Personality Profile (1954) ...	6.6*	6.2*	3.8*	4.3	3.4*
<i>Pupil Inventories</i>					
Family (1950)	6.6*	6.2*	4.7	4.1*	5.6
Social Responsibility (1950) ..	6.0*	5.4	4.5	3.8*	4.8
Responsibility (1954)	6.2*	5.8*	4.2*	4.1*	4.1*
Social Maturity (1950)	5.6*	5.8*	4.8	4.8	4.0*
Adjustment Inventory (1954)	6.2*	6.0*	4.0*	4.6	4.2
<i>Not Significant</i>					
Leisure Time Activities (1950)	4.7	5.0	4.9	5.8	4.9
Psychoneurotic Indicators ..	5.1	5.2	4.9	5.0	5.6
Home Chores (1950)	4.7	4.5	5.1	4.8	4.6
Sentence Completion (1954) ..	5.2	4.8	4.9	4.4	4.4
Likes (1954)	4.5	4.4	4.8	4.8	5.4
Family Attitudes (1954)	5.0	5.1	4.7	5.3	5.1

NOTE.—The number of cases varies as follows: outstanding boys 40-61, girls 45-69; delinquent boys 80-97, girls 13-18; emotionally disturbed girls 7-16. There were not enough disturbed boys to test for significance of differences.

* Significant at the .05 level or better.

ing home practices having to do with trust, sharing decisions, and closeness.

The emotionally disturbed on whom we have information have significantly lower scores on a measure of rural socioeconomic status. This might, however, have been an artifact of our sampling since we used agency referrals and the county clinic. Table I shows only the scores for the girls since the boys' group was not large enough to constitute a sample adequate for statistical analysis. The disturbed girls scored low on the 1954 Responsi-

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bility measure and a measure of personal habits, reflecting social maturity. Their teachers rated them significantly lower than their classmates on the Personality Profile, both in 1950 and in 1954.

None of the special groups differed significantly from the population average in the number of chores performed at home and the number of leisure time activities. Fears and worries from the Psychoneurotic Inventory did not predict membership in any of the special groups, not even the emotionally disturbed. We should remember, however, that these tests were taken in middle childhood or early adolescence and that much research needs still to be done to isolate the signs predictive of psychoneurotic behavior in children in contrast with those known of adults.

The 1954 Family Attitude measure did not significantly differentiate any of the special groups, though the 1950 Family measure did. The 1950 Havighurst instrument contained many items of a *specific* nature covering home practices while the 1954 Family measure asked for a *general* expression of positive or negative attitudes toward family members. This evaluation might be more strongly influenced by the temporary emotional state of the youngster, especially an adolescent trying to liberate himself from home.

The differences in the results of these measures point up some of the problems in the evaluation of the relation between certain areas of early adjustment and later outcome. It may be, for example, that there are a number of psychoneurotic signs which can be reliably pinpointed in childhood, but that the form or content of our questions in this area were inadequate. Similarly, it may be that some way of measuring the affect tone of children's responses to a sentence completion measure could be found which would be significantly related to later adjustment, but, though a great deal of research effort was devoted to developing the scoring procedure used for this semiprojective measure, no significant differences were found in these scores for special group members. Both the Sentence Completion and the Likes measures had been found to have diagnostic value, but they had no significant relation to later outcome. There is some indication that they might be unduly influenced by temporary emotions.

Since IQ and SES had differentiated the special groups from the population average, we wondered whether the other measures were significant only because of their relation to those two variables or whether some of the predictors would differentiate members of a special group from agemates of the *same* intelligence and socioeconomic status. Consequently, we tested for significance of difference on all predictors after control for SES and IQ by careful matching and analysis of variance (Table 2).

The Personality Profile proved to be the instrument which most consistently predicted members of special groups after control for IQ and SES, differentiating outstanding members of both sexes, emotionally disturbed girls (no sample for boys), and delinquent boys. It failed to differentiate the delinquent girls whose sample was quite small. The 1954 Responsibility

TABLE 2

PREDICTOR VARIABLES WHICH DIFFERENTIATED SPECIAL GROUPS AFTER
CONTROL OF INTELLIGENCE AND SOCIOECONOMIC STATUS
BY MATCHING AND ANALYSIS OF COVARIANCE

Variables	OUTSTANDING		DELINQUENT		DISTURBED	
	Boys	Girls	Boys	Girls	Boys	Girls
Personality Profile (1950)	0	0	—	0	—	—
Personality Profile (1954)	+	+	—	0	—	—
Teacher Check List (1950)	0	0	—	0	0	0
Responsibility (1954)	0	0	—	—	—	0
My Jobs MI (Maturity Index) ..	0	0	—	0	0	0
Father's Education	+	0	0	—	0	0
Mother's Education	0	0	—	0	0	0

+, significant at .05 level or better *above* the mean of control group.

—, significant at .05 level or better *below* the mean of control group.

0, not significantly different from control group.

measure differentiated both boy and girl delinquents. A few other variables (parents' education, social maturity) were occasionally significant.

Finally, we sought to discover whether these instruments singly or in combination constituted an adequate screening instrument around which a preventive program might be built. Frequency distributions by outcome for all individuals in each stanine on the significant predictors were obtained for the follow-up group graduating in 1957 where we had information for every child. These indicated that combinations of IQ, SES, teacher ratings, and significant pupil measures were not sufficiently discriminating to serve as a screening instrument for each individual child. Though there were no outstanding youngsters in the lower three stanines and no delinquents in the upper three stanines, there were enough of *both* groups in the middle stanines to reduce the predictive accuracy beyond the point of usefulness as an independent screening instrument. This was true for the boys more so than the girls. Both positive and negative outcomes were more clearly separated for the girls.

SUMMARY AND CONCLUSIONS

1. Scores on a number of pupil inventories and teacher ratings of groups of school children later recognized as outstanding, delinquent, or emotionally disturbed were significantly different from the norms for their age and sex. Singly or in combination, however, they did not prove adequate for predicting outcomes for a particular individual. The best predictor instruments would seem more valuable as supplements to IQ and SES in-

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formation available in school records than as independent screening instruments.

2. A sizeable proportion of the relation between adjustment measures and later outcomes can be accounted for by intelligence and socioeconomic status.

3. After control for IQ and SES, the single predictor which most consistently differentiated special group members from their agemates was a teacher rating scale, requiring ratings of personality characteristics on a five-point scale. As raters, the teachers had the opportunity to compare characteristic behavior of individual children with their agemates and to sample it in different situations over longer periods of time. The personality dimensions covered by the scale were broad enough to characterize both outstanding, disturbed, and delinquent groups and to be meaningful at each developmental stage—late childhood, adolescence, and adulthood.

4. The measure which most effectively differentiated delinquents of both sexes was a pupil instrument measuring social responsibility. It consisted of short descriptive phrases which had been validated empirically against groups known to be high or low on this specific criterion.

5. Measures reporting the range of recreational activities, the number of chores performed at home, the number of experiences liked, the general "affect" as determined from sentence completion tests, and the number of psychoneurotic symptoms all failed to predict membership in any of the special groups.

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VERBALLY EXPRESSED NEEDS AND OVERT MATERNAL BEHAVIORS

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Research concerned with parent-child relationships and the influence of parents on children's social learning and personality development has gradually elucidated a number of avenues through which parents affect their children's development. Recently, child personality development research has been primarily focused on two major avenues of parental influence—the effects of direct parental reinforcements and the more amorphous impact of parents as learning models for children's imitation and identification. Knowledge of the processes of parental influence is, however, incomplete until parents are also studied as individuals *per se*, as well as parents *qua* parents, and relations are explored between the parents' own needs, aspirations, and defenses and the behavior they exhibit with their children.

The present study investigates relations between expressed needs of a group of middle-class women and specific overt behaviors they display toward their children. The investigation focuses on the general question of how, and to what degree, such needs find overt expression in maternal behaviors. The study, in contradistinction to most recent research on parental influence relying solely on *reported* parental behaviors obtained through interviews or questionnaires, is based on data of *observed* maternal behaviors of the *Ss* as they interacted with their children in their homes.

METHOD

Subjects

The sample was comprised of 38 white, middle-class women, mothers of families participating in the Longitudinal Study of Child Development of the Fels Research Institute for the Study of Human Development and living in industrial centers, in small towns, and on farms within a 30-mile radius of the Institute in southwestern Ohio.

Assessment Procedures

Assessment contacts were made with the *Ss* at the Fels Research Institute and in the *Ss'* homes. At the Institute the *Ss* were administered, among other tests, the Edwards Personal Preference Schedule (PPS). Their re-

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sponses to the PPS were scored in accordance with the PPS manual (6), and the scores for the following needs were used as part of the data of the investigation: *n* aggression, *n* dominance, *n* nurturance, and *n* autonomy. These needs were selected for study as ones which might be especially likely to enter into, and influence, maternal behaviors.

Maternal behavior data were obtained through the Fels Home Visit Program. This program, a part of the regular longitudinal data collection procedures of the Fels Longitudinal Study, provides for periodic observations of mother-child interactions as they occur in the homes of the *Ss*. A home visitor, an experienced clinical psychologist specially-trained for the Home Visit Program, makes at least two observation-visits to the homes of the *Ss* each year. Subsequent to each of these visits, the home visitor rates the *S*'s maternal behaviors using the 30 Fels Parent Behavior Rating Scales (PBRs). When observations cover a mother's interactions with more than one of her children, separate PBR ratings are made in respect to the mother's behavior with each child. For the present study, when PBRs were obtained regarding more than one child in a family, the PBR ratings of the mother's behaviors with *one* of her children were randomly selected; the PBR data for the other child or children were excluded. The PBRs so selected represented ratings of maternal reactions towards children ranging from 3 through 8 years of age. The investigation of maternal reactions toward children of such a broad range of ages might be questioned; certain maternal behavior could differ significantly depending on the age of the child. However, previous research (2) has found negligible differences in PBR ratings as a function of age of child within the age span used in the present study.

The time-consuming nature of the Home Visit Program precluded the possibility of determining PBR interrater reliabilities for the sample of this specific study. However, previous research based on the Fels Home Visit Program and the Parent Behavior Rating Scales has demonstrated acceptable inter- and intrarater reliabilities for the scales employed in the current study (2).

The PBR ratings of observed maternal behaviors used in this study were those obtained during the home visit closest in time to the occasion when each *S* was administered the Edwards PPS at the Fels Institute. The median time elapsing between home visit observations and PPS administrations was five weeks.

Hypotheses

The 30 Fels Parent Behavior Rating Scales were originally constructed to assess a large range and diverse variety of parental behaviors (5). Data obtained with these scales have been subsequently analyzed for major "underlying" dimensions of parent behavior by a number of statistical techniques including syndrome analysis, cluster analysis, and first- and second-order factor analyses (2, 4, 7, 8). These various analyses have identified

three—and sometimes four, depending on method of analysis—major dimensions of parent behavior. In a previous study, the present authors found four broad parent behavior dimensions. Cluster analysis was employed, and the criterion for the inclusion of a PBR variable in a given cluster was that the variable must correlate .60 or greater with every other variable in the cluster and less than .60 with all other variables not in that cluster. Parental behavior dimensions identified were: (a) affectional behavior, (b) protective behavior, (c) coercive child controls, and (d) coactive child controls. The first three of these dimensions were selected for investigation in the present study and are listed in Table 1. The intercorrelations of the variables

TABLE I

PBR SCALES REPRESENTING THE THREE MAJOR DIMENSIONS OF MATERNAL BEHAVIOR INVESTIGATED IN THE PRESENT STUDY

PBR Scales Representing Affectional Maternal Behavior

- Affectionateness toward child: hostile—affectionate
- Rapport with child: distant—close
- Direction of criticism: disapproval—approval
- Intensity of contact: vigorous—inert

PBR Scales Representing Protective Maternal Behavior

- Protectiveness: exposing—sheltering
- Solicitousness for child's welfare: nonchalant—anxious
- Babying: withdraws help—overhelps
- Child-centeredness of home: child-centered—child-subordinated

PBR Scales Representing Coercive Maternal Control

- Severity of penalties: mild—severe
- Readiness of enforcement: lax—vigilant
- Coerciveness of suggestions: compliance is optional—mandatory

representing these three dimensions obtained in the original study are presented in Table 2. The magnitude of correlations ranges from .60 to .84 and indicates that, while the variables within each cluster intercorrelate highly enough to justify the assumption of an underlying dimension, the correlations within each cluster were not sufficiently high to permit the PBR scales of these variables to be used interchangeably. In none of the correlations was as much as three-quarters of the variance held in common. In the present study, therefore, while data analysis was organized around the three major maternal behavior dimensions investigated, and general hypotheses were stated in respect to these, tests of these general hypotheses were made by ascertaining relations between the Ss' PPS need scores and each of the PBR variables representing the maternal behavior dimensions under investigation.

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TABLE 2

INTERCORRELATIONS OF PBR SCALES REPRESENTING THE THREE MAJOR
MATERNAL BEHAVIOR DIMENSIONS INVESTIGATED
IN THE PRESENT STUDY
(*N* = 44 in original study) .

PBR Variable	INTERCORRELATIONS		
<i>Affectional maternal behavior</i>	<i>2</i> *	<i>3</i>	<i>4</i>
1. Affectionateness .....	.79 †	.80	.79
2. Rapport .....		.76	.60
3. Direction of criticism (approval) .....			.74
4. Intensity of contact			
<i>Protective maternal behavior</i>	<i>2</i>	<i>3</i>	<i>4</i>
1. Protectiveness .....	.74	.83	.62
2. Solicitousness .....		.67	.76
3. Babying .....			.61
4. Child-centeredness			
<i>Coercive maternal control</i>	<i>2</i>	<i>3</i>	
1. Severity of penalties .....	.82	.73	
2. Readiness of enforcement .....		.84	
3. Coerciveness of suggestions			

* As an aid to inspections in each maternal behavior cluster, the numbers above the correlations correspond to the numbers given the PBR variable in the "PBR Variables" column. These numbers are *not* the original numbers of the specific PBR scales.

† All correlations in Table 1 are product-moment correlations run on normalized data. All correlations presented are significant beyond the .01 level of confidence.

The study explored relations between middle-class women's verbally-expressed needs and their overt maternal behaviors. Operationally, the *Ss'* needs were determined by their Edwards PPS responses; their maternal behaviors were quantified in PBR ratings based on home visit observations of mother-child interactions.

Four general hypotheses were tested. These related the *Ss'* *n* nurturance, *n* aggression, *n* autonomy, and *n* dominance to maternal behavior dimensions. *Hypothesis I*: "Middle-class women's *n* aggression will be negatively related to the amount of overt affection they display toward their children." Parenthetically, it should be noted that hypothesis I, as well as the three hypotheses which follow, is tenable only to the degree that women's verbally-expressed needs find direct expression in maternal behaviors. When internal or external inhibiting forces are present, such needs may not eventuate in relevant actions. Women with aggressive propensities, for example, may not behave aggressively toward their children when internal checks are present such as the anticipation of guilt following aggression and/or when

external inhibiting forces exist, e.g., possible criticism from others for hostile maternal behavior. In addition, mothers may report aggressive urges but use persons other than their children as primary targets for their aggression, e.g., husband, acquaintances, or various minority groups. Nevertheless, while some or all of these possibilities may occur, the present study tests the general proposition that middle-class women's verbally-expressed needs will, beyond chance, find behavioral expression in their parent-child interactions. In reference to hypothesis I, it is expected that women who freely acknowledge aggressive urges will express such aggression overtly toward their children by nonaffectionate and rejectant behaviors. Concerning the specific PBR variables representing the dimension of maternal affection (cf. Table 1), it is predicted that, in comparison with Ss with low *n* aggression, Ss who readily report aggressive desires will: (a) express less overt affection toward their children, (b) maintain less close rapport with them, (c) tend generally to criticize rather than approve of their children's behaviors, and (d) have less intense contacts with their children.

Hypotheses II and III are concerned with women's needs as predictors of their overt protective maternal behaviors. *Hypothesis II:* "Middle-class women's verbally-expressed *n* nurturance will be positively related to the amount of protectiveness they display toward their children." In respect to specific protective maternal behaviors (cf. Table 1), it is predicted that Ss with high *n* nurturance will be especially prone to: (a) act protectively toward their children, tending to shelter them from, rather than exposing them to, potential physical and psychological vicissitudes, (b) be solicitous, i.e., concerned rather than nonchalant, regarding their children's welfare, (c) infantilize their children by overhelping rather than withholding help, and (d) maintain a home in which activities are child-centered rather than child-subordinated.

Hypothesis III relates women's *n* autonomy and their protective maternal behaviors. *Hypothesis III:* "Middle-class women who express strong needs for autonomy will exhibit little protective behavior toward their children." The rationale underlying this hypothesis is less straightforward than those of hypotheses I and II. For the two previous hypotheses, it was assumed that the needs investigated would be directly translated into maternal behaviors; *n* aggression would result in rejectant maternal behaviors and *n* nurturance, in protective maternal behaviors. The reasoning behind hypothesis III is more circuitous. In fact, either of two processes may produce the predicted relation between *n* autonomy and maternal protectiveness. First, mothers with strong needs for autonomy and independence might be expected to value similar needs in their children—at least to the degree that these mothers identify with their children and react to them as extensions of themselves. Such mothers might, then, instigate and reward autonomous behaviors of their children and discourage dependent overtures such as help-seeking or emotional support-seeking calling for maternal nurturance.

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A second possibility also exists. Mothers with strong *n* autonomy may *not* necessarily value autonomous behavior of their children and, therefore, react nonnurturantly when their children make dependent demands on them. Nevertheless, such women may still exhibit little nurturance with their children insofar as they feel their children's dependent overtures are encroachments on their *own* need for autonomy. If the latter were the case, these women might be expected to be especially likely to have child-subordinating, rather than child-centered, orientations (cf. Table 1). In general, however, in respect to hypothesis III, it is predicted that women with a strong *n* autonomy will, in comparison with women with low *n* autonomy, be: (a) less protective of their children, (b) less babying, (c) less solicitous, and (d) less child-centered.

A final hypothesis relates *n* dominance and coercive maternal controls. *Hypothesis IV*: "Women who readily express a need to dominate others will be especially prone to employ coercive controls with their children." Specifically, it is predicted that *Ss* with high *n* dominance, in comparison with *Ss* with low *n* dominance, will: (a) evoke more severe penalties when their children do not follow their rules and regulations, (b) more readily enforce the rules they establish for their children's behavior, and (c) use more coercive suggestions with their children regarding what they—the children—should or should not do.

RESULTS

Table 3 presents relations between the *Ss*' verbally-expressed needs and their overt maternal behaviors. The data in this table have been organized in reference to the four major hypotheses of the study as well as in respect to the specific PBR variables representing the three general maternal behavior dimensions investigated.

Hypothesis I, that the *Ss*' *n* aggression would be negatively associated with the amount of affection they displayed with their children, found general confirmation. Women with high PPS *n* aggression expressed less overt affection toward their children, had less close rapport with them, tended to criticize rather than approve of their children's behavior, and had less intense contacts with their children. In general, then, as represented by the sample of the present study, the verbally-expressed need for aggression of middle-class women *does* find direct behavioral expression in the nature of the affectional relationships these women establish with their children.

Hypothesis II, that the *Ss*' *n* nurturance would be positively related to the amount of protectiveness they expressed toward their children, also found substantiation. The *Ss* whose Personal Preference Schedule responses indicated a strong general need to nurture others were especially protective of their children. In comparison with the *Ss* with low *n* nurturance, in everyday life these women exhibited more protectiveness toward their children,

TABLE 3

RELATIONS BETWEEN SUBJECTS' VERBALLY-EXPRESSED NEEDS AND THEIR
OBSERVED MATERNAL BEHAVIORS
($N = 38$)

PPS Variable	PBR Variable (and direction)	<i>r</i>	<i>p</i>
<i>Hypothesis I—Aggression</i>			
Ready expression of affection		-.40	.01
Close rapport with child		-.53	.01
Direction of criticism (approval)		-.54	.01
Intense contact with child		-.36	.05
<i>Hypothesis II—Nurturance</i>			
Much protectiveness .....		.48	.01
High solicitousness .....		.50	.01
Tendency to baby child .....		.44	.01
Child-centered orientation .....		.45	.01
<i>Hypothesis III—Autonomy</i>			
Much protectiveness		-.25	ns
High solicitousness		-.22	ns
Tendency to baby child		-.23	ns
Child-centered orientation		-.39	.05
<i>Hypothesis IV—Dominance</i>			
Employs severe penalties .....		.23	ns
Readily enforces rules .....		.29	ns
Coercive suggestions .....		.07	ns

were more solicitous of their children's welfare, tended to overhelp rather than underhelp them, and established homes where child-centered orientations predominated.

Hypotheses III and IV received less clear-cut support. In all four correlations concerned with hypothesis III, directions of relations were those predicted; *n* autonomy tended to be negatively associated with protective maternal behaviors. However, only one correlation—that between *n* autonomy and child-centeredness—was statistically significant. All relations concerned with hypothesis IV were in the predicted direction; none was significant.

DISCUSSION

The results indicate that some verbally-expressed needs of middle-class women are directly translated into maternal behaviors. Verbal reports of aggressive urges significantly predict a number of different rejectant maternal behaviors. Similarly, the expression of a general desire to nurture

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others found behavioral expression in the *Ss'* everyday interactions with their children. However, other needs were not, as hypothesized, significant predictors of the *Ss'* behavior with their children. Only one of four correlations between the *Ss'* *n* autonomy and their protective maternal behaviors was statistically significant. The fact that the significant relation occurred between high *n* autonomy and low child-centeredness suggests—though does not conclusively prove—that the need for autonomy in middle-class mothers is less a determinant of low maternal protectiveness as a way of developing valued autonomous behavior in their children than it is a more direct reflection of egocentric desires by the strong *n* autonomy mothers to be "left alone" by their children. It appears that high *n* autonomy mothers may express less nurturant maternal behaviors simply because they feel their children's dependent demands are encroachments on their *own* autonomy.

The final hypothesis that the *Ss'* needs to dominate others would find behavioral expression in the coerciveness of the control methods they employed with their children was not substantiated. Several alternative *post hoc* explanations can be given for the lack of significant relations between variables testing hypothesis IV. None of these explanations, however, can be tested with the data of the present study. One possibility is that the *n* dominance scale of the Edwards PPS is not a predictively useful measure of adult women's need to dominate others (including their children). The PPS, while it is one of the most meticulously constructed of current personality questionnaires (e.g., controlling for social desirability of responses), still—with a few notable exceptions, such as the study by Bernadin and Jessor (3)—awaits construct validation research. In a limited sense, the current study presents evidence for the construct validity of the PPS *n* aggression and *n* nurturance scales. The scales *do* predict the amount of aggression and nurturance mothers express toward their children. It is also interesting to note that middle-class mothers' PPS *n* aggression and *n* nurturance scores are as good, or better, predictors of their overt affectional and nurturant maternal behaviors as are their own self-ratings of their maternal behaviors in these areas. In a previous study (4), the authors constructed self-rating scales of maternal behavior to parallel the same Fels PBR scales employed in the present study. In the previous study, a group of middle-class mothers similar to, and including some of, the *Ss* of the present study rated their own maternal behaviors with these specially-constructed mother self-rating scales. These self-ratings were correlated with parallel PBR ratings made by the Fels Home Visitor on the basis of her observations of these mothers' overt interactions with their children. In respect to the general maternal behavior dimension of affection, correlations between the mothers' self-ratings and the Home Visitor's PBR ratings were .59, .33, and .45 for affectionateness, rapport, and direction of criticism, respectively. These correlations are of the same general magnitude as those obtained in the present study between PPS *n* aggression scores

of the Ss and these same PBR variables (cf. Table 3). In other words, middle-class women's PPS *n* aggression (an assessment of need not specific to mother-child relationships) predicts their overt affectional maternal behaviors as well as do the mother's own self-ratings of these specific maternal behaviors. Moreover, in respect to the prediction of protective maternal behaviors, women's PPS *n* nurturance scores (again not specifically pertaining to mother-child relationships) predict overt protective maternal behaviors *better* than do the mothers' own self-ratings of these behaviors. In the present study, PPS *n* nurturance was significantly correlated with PBR ratings of protectiveness, babying, solicitousness, and child-centeredness; in the previous study, mothers' self-ratings of these same behaviors did *not* predict the degree to which these maternal behaviors actually occurred in everyday mother-child interactions. For some areas of maternal behavior, then, the verbally-expressed needs of women seem to be as good, or better, predictors of their actual maternal behavior practices than are these women's subjective assessments of their own childrearing practices.

Returning to the results of the present study, the fact that the Edwards PPS *n* autonomy and *n* dominance scales were not, as hypothesized, generally predictive of the Ss' overt maternal behavior may have been due to a number of factors including: (a) poor construct validity of the scales for the population sampled, (b) poorly formulated hypotheses, and/or (c) a lack of "true relations" between the variables measured. Answers to these alternative possibilities await future research. At the moment, however, the findings of the present study warrant these general conclusions: (a) Middle-class women's verbally-expressed needs for aggression and nurturance clearly predict the degree that these women *overtly* express nonaffectionate and nurturant behaviors toward their children. (b) There is a lesser trend that the Ss' *n* autonomy is associated with nonnurturant aspects of their maternal behavior. (c) No evidence was found that the Ss' stated desires to dominate others were directly translated into coercive maternal behavior practices.

SUMMARY

This study explored relations between certain verbally-expressed needs of middle-class women (as measured by their Edwards PPS responses) and the overt behavior these women displayed toward their children. Data regarding the latter were obtained from home visit observations of mother-child interactions and subsequent ratings of these maternal behaviors using the Fels Parent Behavior Rating Scales. Four general hypotheses were tested. These were: *Hypothesis I*: "Middle-class women's verbally-expressed *n* aggression will be negatively correlated with the amount of affection they display toward their children." *Hypothesis II*: "The Ss' expressed need to nurture others will be positively associated with the protectiveness they exhibit with their children." *Hypothesis III*: "Women with high *n* autonomy

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will be less protective of their children than will women with low n autonomy." *Hypothesis IV*: "Women who express strong needs to dominate others will be particularly prone to employ coercive maternal controls in their everyday child-socialization practices." Hypotheses I and II were clearly substantiated. Hypothesis III found limited substantiation; hypothesis IV, none. Implications of the findings were discussed.

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AUTHORITARIANISM, OCCUPATION, AND SEX ROLE DIFFERENTIATION OF CHILDREN

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As pointed out by Linton (2), sex role differentiation begins for children in our culture long before there are any significant sex differences in potentials for work or for social participation. By the time children are 3 or 4 years old, quite different parental expectations and disciplinary techniques have developed for girls as opposed to boys (5). Since sex role differentiation serves little, if any, real function in early childhood, the amount of role differentiation imposed by the parent would seem likely to show considerable variation.

Few studies have been done in this area. Scheinfeld (6) and Rabban (4) have shown parental social class to be significantly related to the amount of rigidity shown by parents in the delineation of children's sex roles. Lower occupational groups appear to differentiate sex roles earlier and to a greater extent, leaving a smaller area of behavior permissible to both sexes, than do middle socioeconomic groups. A number of explanations for the obtained differences might be advanced. Jobs that are lower on the job hierarchy may be more masculine than those at the upper end (e.g., bulldozer operator vs. auditor) and hence allow boys from lower economic groups a more masculine model with which to identify. Perhaps there are class differences in ideas about what constitutes masculinity and femininity.

Social classes differ, not only in definition of sex appropriate behaviors, but in other ways as well. One area of difference is in authoritarianism, as measured by the California F Scale (1). Among the hypothesized attributes of those individuals scoring high (on the authoritarian end) on the F Scale is an intolerance of ambiguity (1). Lower economic groups score higher on the F scale than middle or upper economic groups (1). Is, then, their more rigidly defined sex role differentiation due, basically, to their higher degree of authoritarianism?

This study is an attempt to determine the relation of socioeconomic characteristics and of authoritarian attitudes to sex role differentiation.

METHOD

Subjects

Fifty-eight college students taking an upper division course in child psychology served as Ss. Eighteen were parents; 40 were not. Thirty-nine Ss were female; 19 male.¹ It is not claimed that these Ss were representative

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¹ Neither marital status nor sex of subject was related to other variables measured in this study.

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of the occupational groups into which they were categorized on the basis of parental occupation. By the mere fact that they were college students, these Ss constituted a biased sample. However, they were a relatively homogeneous sample in terms of intellectual ability, a definite advantage since many obtained social class differences may be due, basically, to variation between social classes in tested intelligence.

Measuring Devices and Procedure

Information concerning parental occupation was obtained from the Ss. Subjects were divided into occupational groups according to the Minnesota Occupational Scale (7). Subjects were also categorized into "entrepreneurial" and "bureaucratic" groups according to parental occupation, following a distinction made by Miller and Swanson (3). Entrepreneurial parents were defined as those who were employed in small sized businesses characterized by a simple division of labor and small capitalization in which upward mobility and income are obtained through risk taking and competition. Entrepreneurs would be such people as independent stock brokers, realtors, shopkeepers, door to door salesmen, auto salesmen, small contractors, contract fruit and vegetable pickers, or even doctors or clinical psychologists unaffiliated with any institution—men dependent chiefly on their own efforts for income and status. Bureaucratic parents, on the other hand, would be members of large organizations, specialized in division of labor and usually highly capitalized. Prestige and income come not from risk taking or competition but from cooperation, development of specialized skills, and seniority. A plant guard, a clerk in a department store, a General Motors executive, or a college professor would fall into the bureaucratic group.

Subjects were administered the F scale and were then presented with a list of 44 children's behaviors compiled by the senior writer, in order to determine the amount of sex role differentiation made by each S. All of the listed behaviors were presumably of a type that both girls and boys could undertake them, although a number of them were more characteristic of one sex than the other. Ss were told:

Here is a list of things that children aged 6 through 11 do. After each behavior mark down whether you think it to be appropriate for *both* boys and girls, for *boys*, not girls, for *girls*, not boys, or for *neither* sex. For example, if you believe it proper for girls but not boys to cry when hurt, you would write *girls* after the first listed behavior.

RESULTS

Of the 44 behaviors, the number of behaviors rated as appropriate for both sexes by these Ss ranged from 15 to 44. The behaviors rated, along with the difference in the frequency that they were rated as appropriate for one as opposed to the other of the sexes, are presented in Table 1.

TABLE I
RATINGS OF SEX APPROPRIATENESS OF BEHAVIOR

Behavior	Difference in Ratings*	Behavior	Difference in Ratings
Pretend to be father	+52*	Run errands	+ 5
Have paper route	+51	Refuse to obey	+ 3
Play with toy soldiers	+32	Criticize parents	+ 1
Shoot slingshots	+31	Read comic books	+ 1
Play marbles	+30	Ride bikes	0
Build tree houses	+29	Watch T.V. cartoons	0
Play with toy trucks and cars	+28	Play hide and seek	- 1
Fight back when picked on	+25	Cry when hurt	- 3
Play cops and robbers	+23	Paint pictures	- 4
Go to movies alone	+21	Play store	- 4
Help with lawn	+18	Write poems	- 5
Take dares	+18	Be sensitive to feeling of others	- 6
Go around town alone	+14	Learn to dance	-12
Collect insects, bugs	+13	Make own bed	-12
Fly kites	+13	Read love stories	-16
Collect rocks	+10	Jump rope	-29
Go on hikes	+10	Play jacks	-36
Skip school	+10	Help mother cook	-37
Read adventures	+ 8	Play with dolls	-48
Watch T.V. cowboys	+ 7	Play nurse	-52
Collect stamps, coins	+ 7	Pretend to be mother	-55
Start secret club	+ 6		

* Frequency of boy-appropriate ratings minus frequency of girl-appropriate ratings: plus sign indicates more appropriate for boys, minus sign, more appropriate for girls.

Many of these behaviors range far more widely from neutrality than one would expect. Even in this group of college *Ss*, a very wide differentiation of sex roles appears to exist. Two kinds of role restriction can be measured: (a) the number of behaviors said to be inappropriate to both sexes—a "general" form of restrictiveness—and (b) the number of behaviors said to be appropriate to only one sex—a restrictiveness built around the degree of differentiation of behavior expectancies for boys as opposed to girls. The variation between *Ss* in both forms of restrictiveness was analyzed to determine the relation between restrictiveness, F scale score, and measures of occupational level and type.

Forty-six of the *Ss* were reliably (unanimous agreement of three judges) placed into occupational levels I, II, III, V, VI, and VII of the Minnesota Occupational Scale on the basis of parental occupation. They were grouped into levels I and II (professional and semiprofessional), III and V (clerical, small business, skilled and semiskilled labor), and VI and VII (slightly

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TABLE 2

OCCUPATIONAL GROUP DIFFERENCES IN SEX ROLE
ASSIGNMENT AND F SCORE

Occupational Group	MEAN NUMBER OF BEHAVIORS ASSIGNED				Mean F Score
	Both	Boys	Girls	Neither	
I & II (N = 18)	26.3	7.6	5.6	4.5	3.4
III & V (N = 18)	24.3	8.3	6.5	4.9	3.1
VI & VII (N = 10) ...	26.0	7.0	5.4	5.6	3.7

skilled and unskilled labor). The role categorizations and the F scores of these three groups are presented in Table 2.

No significant differences exist between these groups on any of the variables measured. One would expect, from the literature, to find differences both in sex role differentiation and in F scale score.

Miller and Swanson (3) found very few significant differences in child-rearing attitudes and behaviors among a random sample of mothers divided in social classes according to the Warner Index (upper-upper, lower-upper, etc.). They did, however, find very considerable differences between mothers when they were divided according to whether they belonged to entrepreneurial or to bureaucratic groups. The data collected in this study were analyzed according to this differentiating scheme. Thirty-five Ss were reliably (unanimous agreement of three judges) placed, on the basis of parental occupation, in either entrepreneurial or bureaucratic groups. Fifteen Ss fell into the entrepreneurial category; 20 into the bureaucratic group. The mean number of behaviors rated as appropriate for both sexes was 23.3 for the entrepreneurial group; 32.6 for the bureaucratic group. A Mann-Whitney test indicated that the differences in ranks between these two samples in the number of behaviors rated as appropriate for both sexes is significant ($p < .05$); the bureaucratic group has a significantly larger number of behaviors that are appropriate and are sexually neutral. No other differences in the ratings of these behaviors in terms of sex appropriateness are significant, although, since the entrepreneurial group rated less behaviors as appropriate to both sexes, they necessarily placed more behaviors in the other three categories.

Significant differences existed between the entrepreneurial and the bureaucratic groups in F scale scores as well as in ratings of sex appropriateness of behavior. F scale scores had been obtained for all 58 Ss. All Ss were divided into three groups—high, medium, and low—according to the third of the distribution into which their F scale score fell. The 35 Ss who were reliably categorized on the entrepreneurial-bureaucratic dimension fall into the various thirds of the distribution as is shown in Table 3. Table 3 also

TABLE 3

NUMBER OF APPROPRIATE, SEXUALLY NEUTRAL BEHAVIORS BY F SCORE GROUP AND BY OCCUPATIONAL TYPE

	F SCALE GROUPS		
	Low	Medium	High
<i>Entrepreneurial</i>			
Number of Subjects	1	4	10
Mean Number of Behaviors	31.0	26.5	21.2
<i>Bureaucratic</i>			
Number of Subjects	12	6	2
Mean Number of Behaviors	35.7	29.8	22.5

gives the mean number of appropriate, sexually neutral behaviors checked by *Ss* by F score groups and by entrepreneurial-bureaucratic differentiation.

F scale scores are not evenly distributed between the two groups ($\chi^2 = 16.0$, $df = 2$, $p < .01$), with the entrepreneurial group being significantly more authoritarian. A Kruskal and Wallis H test shows that the "appropriate to both boys and girls" rating is not distributed randomly ($H = 8.25$, $df = 2$, $p < .05$) between F scale groups. It is clear that the vast majority of the differences between entrepreneurial and bureaucratic groups in the ratings of these behaviors is related to differing F scores rather than to entrepreneurial vs. bureaucratic occupation *per se*.

DISCUSSION

Within this sample of *Ss* (admittedly a relatively homogeneous sample in terms of IQ and probably in terms of values and aspirations) no significant relations are to be found between position on the Minnesota Occupational Scale and either F score or number of behaviors rated as permissible for both sexes. This may be due to the homogeneity of this biased sample in intelligence and/or in values. It may be, too, that social class differences, with class measured by the Minnesota Occupational Scale or the Warner Index, existed at one time, but do not exist to any large degree at the present time, as suggested by the recent finding of Miller and Swanson of no differences in attitudes or behaviors between *Ss* categorized according to the Warner Index.

Once *Ss* are differentiated into entrepreneurial vs. bureaucratic groups, on the basis of parental occupation, significant differences in both F scale score and in permissible, sexually neutral behaviors are obtained. Table 3 indicates that, if matched for F score, the entrepreneurial-bureaucratic categorization would not, in itself, allow for significant differences in the num-

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ber of behaviors rated as both permissible and sexually neutral. A major aspect of authoritarianism is said to be intolerance of ambiguity. These data tend to support this proposition. A clear cut differentiation of sex roles seems to be rather closely related to authoritarianism. The entrepreneurial group is significantly more authoritarian (as authoritarianism is measured by the F scale), as one would expect from Miller and Swanson's analysis. It seems likely that this high amount of authoritarianism is manifested by Ss in clearly defining the sex appropriateness of children's behaviors.

SUMMARY

A college population of Ss was given the California F (authoritarianism) scale. Ss rated a number of children's behaviors in terms of their sex appropriateness. Measures of parental occupational level and type were used to form subgroups of Ss. No significant differences in F scores or in ratings of children's behaviors were obtained between Ss of differing parental occupational levels on the Minnesota Occupational Scale. When Ss were divided into entrepreneurial and bureaucratic groups, on the basis of parental occupations, significant differences did appear, with entrepreneurial Ss scoring higher on the F scale and rating significantly fewer behaviors as being appropriate to both boys and girls. When behavior ratings were divided within entrepreneurial and bureaucratic groups according to F scale score, F score was significantly related to the number of "appropriate to both boys and girls" behaviors. With F scores held constant, only slight differences appear between the ratings of entrepreneurial and bureaucratic groups. Certain implications of these findings were discussed.

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JUDGMENT OF SIZE IN RELATION TO GEOMETRIC SHAPE

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This is an investigation of perceived size comparisons for figures of the same shape and figures of different shape.

Previous investigators have studied the development of simple perceptual tasks, such as the ability of very young children to select the middle size of three shapes (3, 8, 9), and concepts of roundness (4) and of largest size (5). In these studies the authors were concerned essentially with the development of meanings, of concepts.

Many studies have been concerned with judgment of size as related to constancy and thus to learning and concept formation. Some have questioned whether the tasks which have been used are of a simple perceptual nature or whether more complex judgment is involved. Relevant variables which have been investigated are the experimental situation, attitudes of subjects, age, and intelligence. Osgood agrees with Boring (1) that Martius' almost perfect constancy "looks more nearly like judgment than immediate perception" (6, p. 275). The kind of situation set for Ss apparently influences the degree of constancy. Brunswik (2) used a quite natural situation in which Ss were instructed to select from a number of cubical blocks the one which appeared equal in size to the standard. In this natural situation, Ss showed considerable constancy. Thouless (7) has been interested in the distinction between object-orientation and critical-stimulus orientation and found that the former is associated with an increase in constancy, whereas the critical-stimulus attitude is used more by professional artists and results in less constancy. Thouless hypothesized that the engineer, because of his practical training, will come closer to the "real" aspects of objects and will thus show more "phenomenal regression" toward these "real" characteristics. The increase of constancy with increase in age has been studied,

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but the results are conflicting. Osgood (6) reports that Burzlaff, in a natural situation, using both adults and children, found (a) a high level of constancy and (b) no significant differences according to age. Osgood states: "Considerable interest has attached to the age variable . . . this whole question is very much up in the air at this time" (6, p. 279). The influence of intelligence may be concomitant with increase in age.

The present study approximates the natural situation and object-oriented attitude in the task presented and in the instructions given to Ss and includes both children and adults. However, it is not concerned with the usual variables found in constancy experiments, namely, distance and retinal shape and angle.

This study investigated (a) accuracy of judgments of same-shaped figures and (b) the bases or cues used to estimate equality of different-shaped figures, e.g., comparing the size of a square with a circle or comparing the size of a circle with a triangle. Comparing here means comparing in direct perception, not by measurement or computation. There are several possibilities. A person may base his judgment on estimated areas or the diameter of a circle may be equated with the side of an equilateral triangle. Still another possibility is that a figure may be compared with another by inscribing or circumscribing. Such specific possibilities are termed the pre-designated figures and are included in the variable series.

SUBJECTS

Table 1 presents the grade levels, ages, and number of Ss in each group. None of the Ss in the Arts and Sciences group had had geometry; all the engineering students had had geometry and were in their second semester of mechanical drawing. Each group except the engineers included males

TABLE I

SUBJECTS

Grade	MEAN AGE			N
	Years	Months	Range	
Kindergarten	6	1	± 3 months	15
Second	7	3	± 3 months	15
Fourth	9	5	± 4 months	15
Sixth	11	5	± 3 months	15
Eighth	14	3	± 2 months	15
Arts and Sciences students				15
Engineering students				15
All subjects				105

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and females. The children attend the University School of the University of Kentucky; from the experience of the author in intelligence testing at this school, a conservative estimate of the mean Stanford-Binet IQ is 120. The adults, of course, are college students.

METHOD

Ss were presented a standard figure (a triangle, a square, or a circle) and were asked to select, from a series varying in size, called the variable series, the figure most nearly equal to the size of the standard figure. Each S made a total of 135 judgments. Forty-five of these judgments were similar-figure trials; i.e., the standard figure and the variables were the same shape. The remaining 90 trials were different-figure trials (e.g., the standard figure might be a triangle to be compared with a variable series of circles).

Both the standard series and the variable series were constructed of lemon yellow, antique finish, 80 weight, Buckeye cover paper obtained from the Beckett Paper Company, Hamilton, Ohio.

The standard series consisted of five of each of the following forms: equilateral triangles 15 inches on a side, 10 inches on a side, 5 inches on a side; squares, 15 inches on a side, 10 inches on a side, 5 inches on a side; and circles, 15 inches in diameter, 10 inches in diameter, and 5 inches in diameter. Thus, there were three shapes and three sizes of each shape making nine different combinations. Five random orders of this 45-member

TABLE 2
SIZES OF THE VARIABLE SERIES

<i>Triangles</i>		<i>Squares</i>		<i>Circles</i>	
22.80*	12.00	20.00	9.87*	20.00	9.00
21.21*	11.55*	19.00	9.19*	19.00	8.66*
20.20*	11.00	18.00	9.00	18.00	8.00
20.00	10.00*	17.00	8.66*	17.31*	7.42*
19.00	9.00	16.00	8.00	16.92*	7.00
18.00	8.66*	15.00*	7.00*	16.00	6.00
17.32	8.00*	14.00	6.58*	15.00*	5.64*
17.00	7.60*	13.26*	6.00*	14.00	5.00*
16.33*	7.00*	13.00*	5.00*	13.00*	4.33*
16.00	6.73*	12.00	4.43*	12.00	4.00*
15.00*	6.00	11.31*	4.00	11.55*	3.00*
14.00*	5.77*	11.00	3.54*	11.28*	
13.47*	5.00*	10.61*	3.00*	11.00*	
13.00*	4.33*	10.00*		10.00*	

NOTE.—Values indicate length in inches of sides of equilateral triangles, sides of squares, and diameters of circles.

* Predesignated values.

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standard series were prepared; each *S* was examined with three of these orders.

There were three variable series: squares, circles, and triangles. The size gradations in linear measurements are shown in Table 2. The size intervals are not equal.

In each series, certain predesignated sizes are indicated by asterisks in Table 2. The other values in Table 2 were inserted to provide series of sufficient length and of a higher level of difficulty than was possible with only the predesignated sizes. Table 3 shows the precise values for figures of different shapes when different cues are used as the standard of equality;

TABLE 3
EXPLANATION OF PREDESIGNATED VALUES

<i>Standard</i>	<i>Variable</i>	<i>Possible Cues</i>	<i>15-Inch Size</i>	<i>10-Inch Size</i>	<i>5-Inch Size</i>
Triangle . . .	Squares . . .	Side of <i>T</i> = side of <i>S</i>	15.00	10.00	5.00
		Altitude of <i>T</i> = side of <i>S</i>	12.99	8.66	4.33
		Side of <i>T</i> = diagonal of <i>S</i>	10.61	7.07	3.54
		Altitude of <i>T</i> = diagonal of <i>S</i>	9.19	6.12	3.06
		Area of <i>T</i> = area of <i>S</i>	9.87	6.58	3.29
Triangle . . .	Circles . . .	Side of <i>T</i> = diameter of <i>C</i>	15.00	10.00	5.00
		Altitude of <i>T</i> = diameter of <i>C</i>	12.99	8.66	4.33
		Area of <i>T</i> = area of <i>C</i>	11.14	7.42	3.72
		<i>C</i> inscribed in <i>T</i>	8.66	5.77	2.89
		<i>C</i> circumscribed around <i>T</i>	17.31	11.55	5.77
Square . . .	Triangles . . .	Side of <i>S</i> = side of <i>T</i>	15.00	10.00	5.00
		Diagonal of <i>S</i> = side of <i>T</i>	21.21	14.14	7.07
		Side of <i>S</i> = altitude of <i>T</i>	17.32	11.55	5.77
		Diagonal of <i>S</i> = altitude of <i>T</i>	24.49	16.33	8.16
		Area of <i>S</i> = area of <i>T</i>	22.80	15.19	7.60
Square . . .	Circles . . .	Side of <i>S</i> = diameter of <i>C</i>	15.00	10.00	5.00
		Diagonal of <i>S</i> = diameter of <i>C</i>	21.21	14.14	7.07
		Area of <i>S</i> = area of <i>C</i>	16.92	11.28	5.64
Circle	Triangles . . .	Diameter of <i>C</i> = side of <i>T</i>	15.00	10.00	5.00
		Diameter of <i>C</i> = altitude of <i>T</i>	17.32	11.55	5.77
		Area of <i>C</i> = area of <i>T</i>	20.20	13.47	6.73
		<i>T</i> inscribed in <i>C</i>	12.99	8.66	4.33
		<i>T</i> circumscribed around <i>C</i>	25.98	17.32	8.66
Circle	Squares . . .	Diameter of <i>C</i> = side of <i>S</i>	15.00	10.00	5.00
		Diameter of <i>C</i> = diagonal of <i>S</i>	10.61	7.07	3.54
		Area of <i>C</i> = area of <i>S</i>	13.26	8.86	4.43

NOTE.—*T* = triangle, *S* = square, *C* = circle.

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these are the predesignated values in Table 2. The predesignated figures were constructed to the nearest 0.1 inch; there was no figure constructed whose linear dimension was larger than 22.80 inches because material that large could not be obtained.

PROCEDURE

Each *S* was used for three sessions, spaced at least 24 hours apart. The sessions differed in the figures used as variables; in one session, triangles were used, in another, squares, and in the remaining session, circles were the variable figures. To control practice effects, each set of variable figures was used for the first, second, and third sessions by an equal number of *Ss*.

In each session, 45 standard figures, in one of the random orders, were compared, one at a time, against a variable series. The variable series was arranged in order of size on a large table in front of *S*. On each trial the standard figure was placed on the table and *S*, who walked around the table at will, was told: "Look over all these figures and find the one which is the same size as this one." At the higher age levels, an occasional *S* asked what was meant by size. *E*'s reply was: "I want to find out what *you* mean. Please choose from the table the one which is the same size as this one."

The total number of judgments made was 14,175: *N* equals 105; there were five judgments per combination and three sizes, three shapes, and three standard-variable combinations.

RESULTS

Each *S*'s score is a mean of five trials; for each group, the mean is for 15 *Ss*.

Equality Judgments for Similar-Form Figures

The accuracy of equality judgments for similar-form figures was high at all age levels. The kindergartners were as accurate as the college students. Variability decreased (a) with increase in age and (b) with decrease in size of figure. Table 4 shows the results for similar-form judgments.

Equality Judgments for Different-Form Figures

In a comparison of figures of different shapes it is not meaningful to establish an arbitrary measure of accuracy as a criterion. Some other basis or cue must be used. Table 3 shows the possible ways by which figures of different shapes could be compared. That is, *S* might use area or equal sides or altitude equal to diameter. The *t* test was used to compare the mean of each group for every size-shape comparison with each of the predesignated values or possible cues. Table 5 shows the apparent cue used for each standard-variable comparison. The last column shows the number of groups, out of a total of seven age groups, who apparently used the cue; i.e., no

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TABLE 4
RESULTS FOR SIMILAR-FORM JUDGMENTS IN LINEAR INCHES

Standard	Variable	Kinderg. 2nd Grade 4th Grade				6th Grade 8th Grade				Coll. Stud. Engineers All Groups				
		G	R	O	U	P	G	R	O	U	P	G	R	O
Mean	15-Inch T	14.9	15.5	15.4	15.6	.6	15.5	15.8	16.0	15.5	.8			
SD		1.1	.9	.6	.6		.5	.5	.5	.5				
Mean	10-Inch T	10.3	10.4	10.2	10.2		10.3	10.4	10.6	10.3				
SD		.7	.6	.5	.8		.3	.4	.5	.6				
Mean	5-Inch T	4.9	5.1	5.1	5.1		5.0	5.1	5.1	5.1				
SD		.5	.6	.1	.1		.1	.2	.0	.3				
Mean	15-Inch S	15.4	16.8	14.8	15.2		15.1	15.1	14.2	15.2				
SD		1.3	2.4	.9	.6		.5	.5	2.0	1.6				
Mean	10-Inch S	9.8	11.3	10.2	10.3		10.2	10.2	10.4	10.3				
SD		.7	1.5	.4	.3		.2	.4	.4	.8				
Mean	5-Inch S	4.8	5.6	5.1	5.0		5.0	5.0	5.2	5.1				
SD		.4	1.0	.2	.0		.0	.1	.3	.5				
Mean	15-Inch C	15.2	14.9	14.5	14.8		14.8	15.0	15.5	15.0				
SD		.8	.6	.4	.4		.5	.3	.6	.6				
Mean	10-Inch C	10.1	10.3	9.9	10.2		10.2	10.3	10.5	10.2				
SD		.8	.6	.3	.3		.3	.4	.5	.5				
Mean	5-Inch C	4.9	5.2	5.0	5.0		5.0	5.1	5.1	5.0				
SD		.4	.6	.1	.0		.0	.0	.5	.3				

Note.—T = triangle, S = square, C = circle.

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TABLE 5

RESULTS FOR DIFFERENT-FIGURE COMPARISONS IN LINEAR INCHES
FOR THE SEVEN GROUPS

Standard	Variable	Mean	SD	Apparent Cue Used	No. of Groups Using Cue
15 T	S	12.57	1.71	altitude = side	7
10 T	S	8.62	1.13	altitude = side	5
5 T	S	4.24	.53	altitude = side	6
15 T	C	12.92	1.84	altitude = diameter	7
10 T	C	9.13	1.34	altitude = diameter	5
5 T	C	4.52	.69	altitude = diameter	4
15 S	T	19.84	1.86	diagonal = side	2
10 S	T	13.90	2.11	diagonal = side	5
5 S	T	7.12	1.14	diagonal = side	6
15 C	T	18.94	2.13	equal areas	5
10 C	T	12.99	1.88	equal areas	5
5 C	T	6.60	1.16	equal areas	7
15 C	S	14.84	1.73	diameter = side	6
10 C	S	9.96	1.11	diameter = side	6
5 C	S	4.86	.58	diameter = side	4
15 S	C	16.46	1.52	equal areas	6
10 S	C	11.45	1.01	equal areas	6
5 S	C	5.78	.61	equal areas	6

NOTE.—T = triangle, S = square, C = circle. The seven groups are the seven grade levels, as kindergarten, 2nd grade, 4th grade, etc.

statistical difference between the mean of each group and the actual dimension for the specific cue was shown by the *t* test.

Size of figures and grade level of *Ss* are omitted in Table 6.² Size did not influence the cue used; when a 15-, 10-, or 5-inch triangle was compared with squares, *Ss* consistently, over all three sizes, equated altitude of triangle with side of square. Age or grade of *Ss* did not influence the cue used; kindergarten through college students used the same apparent cues. All conclusions based upon *t* tests were confirmed by analyses of variance. No sex differences were found. *Ss* were very consistent within themselves in overestimation or in underestimation as measured by the coefficient of concordance.

² Results are presented by groups and sizes in Table A which has been deposited as Document number 6605 with the ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D.C. Copies may be secured by citing the Document number and by remitting \$1.25 for photoprints, or \$1.25 for 35 mm. microfilm. Advance payment is required. Make checks payable to: Chief, Photoduplication Service, Library of Congress.

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TABLE 6
COMBINED RESULTS FOR DIFFERENT-FIGURE COMPARISONS

<i>Standard</i>	<i>Variable</i>	<i>Apparent Cue Used</i>	<i>No. of Groups Using Cue*</i>
Square	Circle	equal areas	18
Square	Triangle	diagonal = side	13
Circle	Square	diameter = side	16
Circle	Triangle	equal areas	17
Triangle	Square	altitude = side	18
Triangle	Circle	altitude = diameter	16

* Total $N = 21$ groups (seven grade levels and three sizes).

DISCUSSION

The results suggest that fairly accurate judgment of similar-shaped figures develops before six years of age.

The results also suggest that the cues used as the basis for judgments did not differ according to age of *Ss* or size of figures, but rather according to the figures themselves. Area was used when the standard was a square and circles were the variable and when the standard was a circle and triangles were the variable figures. Altitude was used when the triangle was the standard; i.e., altitude was made equal to the side of a square or the diameter of circles. In the other two comparisons, the longest dimension was most commonly used; i.e., the diagonal of the square was made equal to the side of the triangle and the diameter of circles was equated with the side of squares. Thus, multiple cues were used, and these cues seem to have depended on which shape was the standard and which was the variable.

In general, variability decreased with increase in age. Except for the engineering students, there was a fairly sharp break between the second and fourth graders, the older children showing less variability in their judgments. The engineering students walked around the table, looked at the variable stimuli, and muttered formulas to themselves. Of course, they did not know the sizes of the figures, and, therefore, these formulas were of no help. Their attempts to go beyond the task presented (comparing the figures spread on the table) by doing formulas in their heads when they did not know the true sizes of the figures, may not have remembered the formulas correctly, and may have made miscalculations probably accounted for the greater error in their judgments.

An interesting finding was the greater variability in judgments of squares and least variability in judgments of circles. This may be related to a decrease in the number of angles, from squares to triangles to circles.

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Graphs were drawn showing each S's score on each of the 27 combinations of standards, sizes, and variables to investigate whether the means were obscuring real differences in behavior. There was the possibility that some Ss, for example, might equate the side of a triangle with the side of a square and that other Ss might make the side of a triangle equal to the diagonal of a square. If this occurred, the mean for the group might indicate that the basis for judgment was altitude of triangle equal to side of square. The graphs show that this did not occur. Most Ss' scores fell close to the point indicated by the mean of the group which, in turn, did not differ significantly from the value to be expected if altitude of triangles were equated with side of squares. These graphs are not presented since they merely confirm previous statistical analysis.

The possibility that area is the commonly used basis for comparing the size of all figures was not borne out by the results of this study. Area was used in only two of the six comparisons of different-shaped figures. Further validation appears in the responses of Ss. At the end of the three sessions, each S was asked: "Can you tell me how you decided which square was equal to a triangle, etc.?" They frequently mentioned height, sides, and diameter as determinants of equality. They mentioned area in the judgment of circles, and the apparent cues in Table 4 indicate that area was used in two of the major comparisons of circles. Some Ss declared they "never thought of area" as a basis for their judgments.

SUMMARY

Ss ranging in grade from kindergarten through college were presented with a standard series of figures and were asked to select from a variable series the figure which was most nearly equal in size to the standard. Forty-five of these judgments were similar-figure trials; 90 were different-figure trials.

On the similar-figure trials (a) Ss were accurate in estimation of equality of size; (b) young children were as accurate as adults; (c) variability of group judgments decreased with increase in age; (d) variability of group judgments decreased with decrease in size of the standard presented.

On the different-figure trials (a) the basis for judgments differed according to whether figures were in the standard or variable series; (b) cues differed according to the shapes of the figures; (c) the same cues were used by all groups regardless of size of figures; (d) there were no age or sex differences; (e) in one-third of the comparisons, area was used in estimating equality of size.

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INADEQUATE MOTHERING AND DISTURBANCE IN THE NEONATAL PERIOD¹

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Much speculative writing has been done about adequate mothering in infancy. Vague terms such as "tender loving care," "emotional warmth," and "affectionate attitude" pervade the literature. But to the writers' knowledge, little controlled research has been done on determining the significant variables involved. For example, in the Yale rooming-in project (10) infants were placed with their mothers shortly after birth and the effects of the continuous maternal contacts observed. However, the investigators do not specify the variables involved, nor could they designate what produced positive effects in some instances and negative effects in others. A few investigators (e.g., 3, 9, 12) have made inferences about adequate mothering on the basis of deprivation studies, but here too the variables are only crudely identified. The mother or her behavior is viewed as being a "psychological organizer" (3), reliever of "physical tensions" and gratifier of "cravings for movement and stimulation" (9), and a provider of "emotional supplies" (12).

On the basis of her pioneer observations, Ribble (11) drew more specific conclusions than many more recent investigators. For her, the infant has an intrinsic need for contact with a mothering person and requires ample amounts of auditory, tactile, and kinesthetic stimulations for adequate development. However, Ausubel (1) is a recent critic of the "plentiful fondling" view. He believes that the evidence has not indicated there are persisting effects of maternal deprivation prior to six months of age. For Ausubel, intensive mothering is unnecessary during this early infantile period; adequate development occurs under ". . . a minimal amount of stimulation, personal attention and individualized care . . ." (1, p. 122). However, Ausubel does not detail what constitutes the "minimal amount."

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Thompson (14), on the other hand, tentatively agrees with Ribble's general thesis. After reporting the McGill stimulus deprivation research on puppies and reviewing other animal studies on early environmental restrictions, Thompson concludes that ". . . restriction of experience occurring early in life definitely retards normal development, [however] it is not in itself stressful, if stress is taken to refer to some sharp change of the stimulus situation . . ." (14, p. 133).

Thompson further states, "Any radical change in a fairly well-structured environment will usually produce a strong affective reaction" (14, p. 133). In our view minimal stimulation of the human neonate probably constitutes a radical change from the continuous mild to moderate stimulations we believe are normally provided in the fetal environment. The fetus obviously is "wrapped in the firm support of the amnion." And as the mother breathes, walks, and otherwise changes position, even in sleep, the fetus is rather continuously subjected to mild and varied but more or less rhythmical cutaneous, kinesthetic, vestibular, and (to some extent) auditory stimulations. However, at present the evidence is quite tenuous that a need for such stimulations is acquired in this manner.

According to Carmichael (5), the fetus is capable of receiving cutaneous and kinesthetic stimulations by the twentieth week. Gesell and Amatruda's (8) findings suggest that the kinesthetic, cutaneous, and vestibular senses may be the only ones capable of responding to mild stimulations at birth. It appears possible that the cushioned, constantly varying pressure and positional changes imposed on the fetus play significant roles in the acquisition of the sensitivities present at birth, as well as in the acquisition of rudimentary needs for considerable stimulation of the types mentioned.

In summary, we may state that, although the long range consequences of mild stimulus deprivation as opposed to severe deprivation in early infancy still may be debatable, increased "affective reaction" or disturbed behavior should be an immediate effect of mild deprivation, if the above observations are correct. Since birth itself is an abrupt environmental change, it would appear that adjustment in the neonatal period should be facilitated by continuing the kinds and amounts of stimulations present during the fetal period, insofar as possible.

PROBLEM

The present experiment is concerned with the immediate effects of moderately different treatments of neonates during their brief hospital stay. One group was given no more handling than necessary in routine care and feeding, and the other was provided a moderate amount of "Ribble-type" mothering (moderate in terms of the amount assumed to be normally operating prior to birth). The experimental hypothesis was that the "non-mothered" (N-Mo) group would show more disturbed behavior than the "mothered" (Mo) group.

METHOD

Subjects

The *Ss* were 20 neonates in the University of Missouri Medical Center's newborn nursery ward, divided equally into the Mo and the N-Mo groups. All were full term and biologically normal as determined by the staff pediatricians. Fourteen neonates were not used because they failed to meet these criteria; two were discarded at the age of two days because they acquired a respiratory disorder; and a few other prospective *Ss* were not used because the *E* limited himself to a maximum of three *Ss* at a time.

The *Ss* were assigned to one or the other of the two groups alternately as they were admitted to the ward, insofar as this was possible consistent with placing prospective breast-fed infants in the Mo groups and prospective bottle-fed infants in the N-Mo group.

The decision on bottle- or breast-feeding was made jointly by the pediatrician in charge of each case and the mother. It was based on the mother's expressed preference and the pediatrician's judgment of her biological ability to nurse her infant. The mothers of all Mo group infants preferred breast feeding and were judged biologically capable on the basis of previous breast feeding, adequacy of nipple, etc. In the N-Mo group five of the mothers were judged biologically incapable of breast feeding and had consented to bottle feeding. The five remaining mothers preferred bottle feeding although judged biologically capable of breast feeding. Parenthetically, it is to be noted that all Mo infants received supplemental bottle feedings of Karo water for most of their hospital stay, i.e., nearly three days. Previous research (4, 6, 10, 13) indicates that type of feeding and feeding preference of the mother have no relation to the type of dependent variables investigated in the present study.

Only a secondary attempt was made at equating the groups for sex and skin color because previous research (2, 4, 7) suggests that these factors as such have no significant influence on the variables investigated here. In addition, biological normality and control of mode of feeding were considered more important for the study. The Mo group consisted of six males and four females, and the N-Mo group had three males and seven females. Three of the Mo group were white and seven brown, while the skin colors were equally divided in the N-Mo group.

Equipment and Materials

Nursery. The nursery was a soundproof room with dehumidified air and a constant temperature of 72° F. The 12 bassinets in the nursery were identical, consisting of transparent baskets mounted on stainless steel cabinets. A rocking chair and all the equipment needed for infant care were located in the room.

Materials. Medical record forms completed by the hospital staff provided information on age of the mother, ordinal position of the neonate, length of labor, initial weight, etc.

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A behavior data sheet, constructed for the study, was used for determining the following data:

a. *Amount of crying*, in average minutes per hour, divided into sub-categories according to the period when it occurred or to the apparent instigator. *Prefeeding crying* (stimulus unknown) was any crying, often accompanied by rooting and sucking, within 30 minutes of feeding time when no external stimulus could be found. *Postfeeding crying* (stimulus unknown) was that which occurred within 30 minutes after feeding and was not due to any determinable external stimulus. *Between feedings crying* (stimulus unknown) was crying which occurred for no determinable reason between the postfeeding and prefeeding periods. *External stimulus crying* was any crying associated with wet or soiled diapers, bathing, changing clothes, circumcision of males, picking up when asleep, and any other sudden or intense stimulation.

b. *Amount of sleeping*, in average minutes per hour. An infant was considered asleep when its eyes were closed, and it appeared relaxed and unresponsive to external stimulation.

c. *Amount of vomiting*, in average number of vomits per hour.

d. *Amount of handling*, in average minutes per hour. Total handling included nursing care and mothering care, the latter for the Mo group only.

Procedure

Treatment of nonmothered group. The treatment of the N-Mo group followed the usual hospital procedures, except for a few modifications to be noted later. Each infant was brought to the nursery within one hour after birth. The nurse on duty then administered initial nursing care, consisting of washing the infant's hair, putting saline solution in its eyes and hydrogen peroxide to its cord, and dressing it in a diaper and a long-sleeved cotton undershirt. Following this, she placed the infant on its abdomen in its bassinet and covered it loosely with two blankets. After 12 hours it was placed on an approximate four-hour feeding schedule, with the actual intervening time between feedings varying from 3.5 to 4.5 hours. At about 8:00 A.M. and 5:00 P.M. daily the ward physicians made rounds in the nursery. At one or the other of these rounds each infant was undressed and examined by a physician. Diaper changes and eye and cord care were performed whenever it was considered necessary. After the first day, each infant was bathed once daily.

During the fourth postnatal day, the male infants were circumcized. This took approximately one hour to perform. Because of the larger number of male infants in the Mo group, any negative effects of the circumcisions would bias the results against the experimental hypothesis.

The modifications from the normal hospital routine were the following: All N-Mo Ss were bottle fed on a standard hospital formula until they stopped sucking. Normally this took between 15 and 20 minutes. Bottle feeding was done rather than breast feeding in order to keep handling to

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a minimum. Originally it was planned to do all the feeding in the bassinet, but we had to compromise with current practice and let the mothers feed their infants for four of the six meals per day. Only the 2:00 A.M. and 6:00 P.M. bottles were given in the bassinets.

Each time the infant cried, either the *E* or the ward nurse on duty made a systematic check of the source, which was eliminated if it was an external stimulus. If the cause was determined to be hunger and the crying occurred within 30 minutes of the scheduled feeding time, the infant was fed. Otherwise the infant was allowed to cry, and the crying time was recorded. The nurses and aides were instructed to handle the infants of both groups no more than necessary in their nursing care.

Treatment of the mothered group. Treatment of the Mo group was similar to that for the N-Mo group in all respects except for breast feeding (with supplemental bottle feeding of Karo water for about the first three days) and the special handling given at feeding time. Since the mothers of this group were to provide the mothering handling of their infants when they were capable, careful instruction and practice was given them in the appropriate method. The *E* showed each mother how to hold the infant with its limbs in fetal position, firmly wrapped with blankets, and in close contact with her body. She also was instructed to rock it gently and rhythmically when it was through feeding and to avoid giving it any sudden stimulation. The *E* and the nurses made regular observations to make certain the mothers were providing handling that met the criteria of firm support, fetal positioning, and mild rhythmic stimulation. The nurses and aides were given similar instructions by the *E* in how to give mothering care to the Mo infants when it was necessary for them to take over from the mothers after feeding.

The total time allowed for feeding and mothering care of the Mo Ss was 30 minutes at the 2:00 A.M. and 6:00 A.M. feedings and 60 minutes at the other four sessions. If some interference prevented the mother from handling her infant the full allotted time, the *E*, a nurse, or an aide completed the mothering care in a rocking chair upon the infant's return to the nursery, even if it was asleep. At other times the Mo infants received the minimal amount of handling necessary in nursing care.

E observed the Ss of both groups throughout the study and made the appropriate entries on the data sheet except for the periods from 1:00 A.M. to 6:00 A.M., and at his mealtimes each day. During these times the nurse on duty made the observations and recordings, in accordance with instructions given her by the *E*.

RESULTS AND DISCUSSION

The variables considered important with regard to the equivalence of the Mo and N-Mo groups at birth were those indicative of biological health and reactivity. The measures used for determining initial equivalence were

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birth weight, birth temperature, number of reflexes at birth, length of labor, mother's age, and her number of children.

Because these data are only indirectly relevant to the study, it seems sufficient to state that *t* test analyses of the various measures on the two groups showed no difference which approached the .05 level. Insignificant initial differences were to be expected especially on variables of the *Ss* (weight, temperature, and reflexes) because only full-term and biologically normal infants were used.

The results of direct relevance to the experimental prediction of more disturbance in the N-Mo group are those concerned with the treatments and reactions of the two groups during their stay in the hospital. As Table 1 shows, the infants of both groups were under the conditions of the study an average of only about 4.5 days. Congruent with the experimental design, the Mo group was handled an average of over three times as much as the N-Mo group (11.02 vs. 3.15 min. per hr.).

TABLE I
COMPARISON OF THE NONMOTHERED AND MOTHERED NEONATES
(*N* = 10, each group)

Variable	NONMOTHERED		MOTHERED		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age at end of study (in days)	4.33	.65	4.61	.45	.99	
Handling (av. min./hr.)	3.15	.56	11.02	.84	24.51	.01
Crying (av. min./hr.)	5.42	.56	3.37	.32	9.51	.01
Prefeeding, unknown stimulus	1.95	.64	1.23	.53	2.72	.05
Postfeeding, unknown stimulus .....	.42	.34	.27	.18	1.18	
Between feedings, unknown stimulus	2.34	.33	1.08	.29	9.13	.01
External stimulus	1.31	.40	1.18	.48	1.31	
Vomits (av. no./hr.) .....	.02	.01	.01	.01	.66	
Sleep (av. min./hr.)	43.47	1.80	41.83	2.81	1.84	

The crying reactions of the two groups appear to support quite well the hypothesis of the study. As to total crying, the N-Mo infants cried an average of 5.42 min. per hr., and the Mo infants an average of 3.37 min. per hr. As shown in Table 1, the difference is significant at well beyond the .01 level ($t = 9.51$; t of 2.88 required for .01 level). Moreover, only one Mo infant averaged more crying than the lowest N-Mo infant (4.86 to 4.83 min. per hr.).

When the crying reactions for unknown reasons were isolated in terms of the period in which they occurred, it was found that the N-Mo group showed significantly more prefeeding crying (.05 level) and over twice as much crying between feedings ($t = 9.13$, significant at far beyond

.01 level). However, as Table 1 shows, the relatively small amounts of crying in the half-hour postfeeding periods were not significantly different.

The fact that both groups showed relatively little crying in the post-feeding period suggests that the feeding itself has an immediate tranquilizing effect which tends to mask any similar effect of the mothering given during and after feeding. The disturbing effect of insufficient mild, rhythmical stimulations at feeding time tended to be manifested later in the feeding cycle. Moreover, the insignificant group difference in crying associated with external "annoyances" (usually nursing care in the between feedings period) suggests that the different total amounts of mild stimulation received by the two groups has no direct relation to intervening reactions to sudden or intense stimuli.

No prediction was made concerning the relative amounts of sleeping expected of the two groups. This was because the relation between mild, rhythmical stimulation and sleep appeared complex and little known. For example, we might have predicted greater sleep in the Mo group because less disturbance was anticipated or less sleep because the extra stimulation would keep this group awake longer or less sleep because less fatigue was expected in this group. Whatever opposing factors may have been operating, if any, the results show that the Mo group averaged slightly less sleep, but the difference is not significant at the .05 level.

We had thought that the N-Mo group might show significantly more vomiting, but only if the lesser handling had been extremely disturbing (13). The fact that the groups did not differ significantly in vomiting suggests, as does the only moderate total amount of crying in the N-Mo group, that "routine" hospital treatment had some but not extremely disturbing effects on the immediate adjustment of neonates.

We may add parenthetically that the nonsignificant differences in both vomiting and postfeeding crying suggest the formula-by-bottle feeding was as "satisfying" to the N-Mo infants as the breast feeding was to the Mo group. This is in agreement with previous findings (e.g., 6, 13).

In general, we may conclude that the results of this study are consistent with a stimulus deprivation hypothesis which states that disruption of "familiar" stimulus patterns results in generalized tension or disturbed behavior. In this instance we were concerned only with a moderate lowering of the amounts of mild pressure, positional, and rhythmically changing cutaneous stimulations in the neonatal period from those which presumably impinge on the average fetus. Although the differences in disturbance found are far from extreme, the findings appear to be in the same direction as those of previous studies concerned with more severe and prolonged deprivation (e.g., 3, 7, 12).

In line with the above, the results also may be interpreted as being consistent with a prenatal primitive learning hypothesis concerning the development of sensory "needs." However, they of course do not directly support such an hypothesis any more than an "innate need" hypothesis.

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More definitive research would be concerned with investigating directly the *relation of variations in prenatal stimulation and amounts of mothering administered postnatally*. For example, according to the prenatal learning hypothesis, *infants who have had high amounts of prenatal stimulation should show more disturbance under low amounts of postnatal mothering than under high amounts of postnatal mothering*; but the reverse difference probably should occur among infants who have been subjected to low prenatal stimulation. However, the problem of controlling nutritional and other possible extraneous variables between the two prenatal groups is an extremely difficult one; e.g., active mothers probably provide somewhat different nutriments than inactive mothers.

SUMMARY

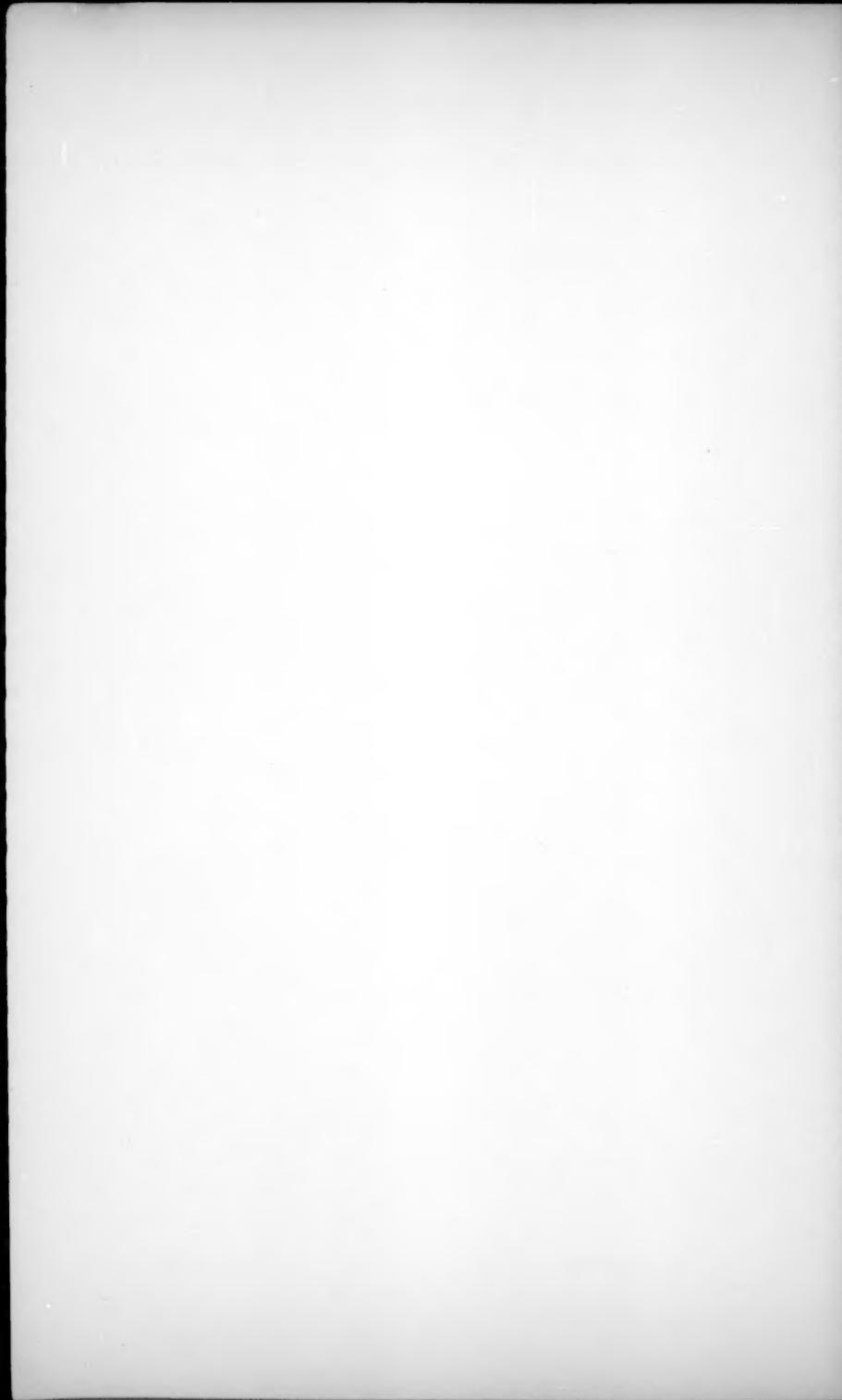
An experiment was conducted to investigate certain characteristics of mothering and their effects on the human neonate. It was proposed that adequate mothering of newborns consists of continuing the patterns of stimulation which normally occur intrauterinely, especially mild pressure and rhythmically changing cutaneous stimulation. On this basis the hypothesis was proposed that a deficiency in such stimulation of the neonate results in disturbed behavior.

The Ss were two groups of 10 biologically normal neonates who were under the experimental conditions for about 4.5 days following birth. One group ("nonmothered") was handled no more than necessary in routine hospital care, and the other ("mothered") was treated the same way except for the administration of specified lengths of mild, firm support and rhythmical body stimulations at feeding times. The results showed that the non-mothered group cried significantly more than the mothered group, particularly when no external instigation was present. It was concluded that the results support the hypothesis; however, more definitive research will be necessary to determine whether differences in prenatal stimulus conditions are related to the type and amount of postnatal mothering needs.

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ASSOCIATIVE CHARACTERISTICS OF SIXTY-THREE ADJECTIVES AND THEIR RELATION TO VERBAL PAIRED-ASSOCIATE LEARNING IN CHILDREN¹

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Considerable information regarding verbal learning phenomena has been derived from studies employing the paired-associate method of learning. Fruitful use of this method has been made in conjunction with adult (college age) populations in the empirical and theoretical analyses of such areas of investigation as learning, motivation, and personality. Although it would seem readily adaptable, and considering that the only major requirement determining selection of subjects to be studied by this method is the ability to read, it is surprising that it has not received systematic attention in connection with younger (elementary school age) populations. Characteristically, work with this method has employed verbal material (word lists), e.g., adjectives, nonsense syllables, etc., whose associative characteristics have been assessed. Examples of word lists which have been standardized on adult populations and used extensively in paired-associate as well as serial learning experiments are those described by Hilgard (1). However, comparable lists which have been standardized on younger populations are not currently available.

The present report describes the associative characteristics for 63 common adjectives obtained from a population of fourth, fifth, and sixth grade children. The procedure that was used is an adaptation from one followed by Russell and Storms (2) in their development of norms of associative strength in a college age population. Basically, the procedure represents a variation of the word-association method. The frequencies with which given associations occurred to each adjective are described. In order to assess the utility of the present list for paired-associate learning in children, two lists consisting either of high or low association values between the

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word pairs were employed in a paired-associate experiment involving fifth and sixth grade children.

METHOD

The experimental list was composed of a total of 69 common adjectives judged to be within the range of reading ability of fourth, fifth, and sixth grade children. However, six adjectives are omitted from the present report since approximately 13 to 22 per cent of the *Ss* in the present sample failed to read these words correctly.

The words were typed in upper case letters and exposed by means of a Hunter Card Master (Model 340). Each word was exposed for 8 sec. with 2 sec. between exposures and a 10-sec. interval between exposure of the 23rd and 24th words and between the 46th and 47th words. Three different orders of exposing the words were used, and *Ss* were randomly assigned to one of these conditions.

The *S* was required to call out any words that the adjective made him think of after first having read it aloud. Each *S* was given a practice list in order to insure that he comprehended what was to be required of him and to identify those *Ss* with marked reading disabilities. During the practice list *S* was prompted to give single words rather than phrases and encouraged to give as many word-associations as possible within the 8-sec. interval. The practice list consisted of 10 words exposed in the following order: CAT, BOY, RUN, DOG, GIRL, ONE, SPOT, BROWN, JUMP, MOTHER. All *Ss* met a criterion of nine or more words read correctly and one association given to each word on the practice list.

A total of 95 *Ss* participated. However, the data of 13 *Ss* from the total sample were excluded. These *Ss* either failed to read correctly approximately 50 per cent of the first 23 words on the experimental list or failed to give associations to approximately 50 per cent of the first 23 words.

RESULTS

The 63 adjectives are listed alphabetically. Following each adjective are the associations given to it in order of decreasing frequency. Frequency is given as the percentage (in parentheses) of the *Ss* from the final sample of 82 who gave the word as an association. In order to facilitate use of the present list, associations which also appear as stimulus items in the list are reproduced in capital letters. Also, an association which is asterisked indicates that it occurred as an association to one or more of the other stimulus items in the list. All associations which were either proper nouns or pronouns have been excluded. Finally, all associations which occurred with a frequency of one (1.2 per cent) are not reported. Since there were over 2,000 such associations they are omitted for reasons of space.³

³ Copies of these are available upon request.

CASTANEDA, FAHEL, and ODOM

<i>Stimulus</i>	<i>Response</i>
ABLE	do(12) can(11) unable(8) can't(2) good*(2) well(2)
AFARID	scared*(61) frightened(16) brave(8) fear(4) unafraid(4) coward(2) ghost(2) good*(2) happy*(2) knife(2) nervous(2)
ANGRY	mad*(61) happy*(12) mean*(6) BAD*(5) SAD*(5) good*(4) NICE*(4) cruel(2) glad*(2) unhappy*(2)
BAD	good*(37) mean*(18) naughty(11) NICE*(6) ANGRY(4) WRONG(4) COLD*(2) mad*(2) terrible(2)
BEAUTIFUL	PRETTY*(62) ugly*(23) NICE*(10) lovely*(7) beauty*(6) wonderful*(6) flower*(5) girl*(4) gorgeous*(4) AWFUL*(2) butterfly(2) house*(2) tall*(2)
BEST	good*(46) worst(8) BAD*(7) NICE*(7) clothes*(4) AWFUL*(2) BETTER(2) FINE*(2) flower*(2) friend*(2) less*(2) like*(2) wonderful*(2)
BETTER	good*(24) worse(13) BAD*(5) NICE*(5) AWFUL*(4) well*(4) work(4) BEST*(2) butter(2) FAIR*(2) FINE*(2) OLD*(2)
BIG	LARGE*(37) LITTLE*(28) SMALL*(24) tall*(23) huge*(8) medium*(7) FAT*(6) enormous*(5) giant*(5) round*(5) high*(4) gigantic*(2) man*(2) STRONG(2)
BRIGHT	LIGHT*(33) sun*(17) moon*(16) DARK*(15) shiny*(7) PRETTY*(6) sky*(6) dull(5) star(5) day*(5) color*(4) dim*(4) night*(4) black*(2) colorful(2) glaring(2) NEW*(2) smart(2) sunny*(2)
BROKEN	fixed(12) cracked(8) glass*(7) leg(7) break(6) broke(6) arm*(5) HURT(5) dish(4) unbroken(4) vase(4) car*(2) dropped(2) fell(2) half(2) pieces(2) shatter(2) toys*(2)
CLEAN	dirty*(43) filthy(5) CLEAR(4) clothes*(4) dirt(4) DRY*(4) bath*(2) house*(2) mean*(2) NICE*(2) PRETTY*(2) room*(2) sanitary(2) wash*(2) white*(2)
CLEAR	glass*(10) water*(10) BRIGHT*(7) CLEAN*(7) DARK*(5) see(5) sky*(5) cloudy(4) dirty*(4) NICE*(4) blue(2) clouds(2) COOL*(2) day*(2) FAIR*(2) foggy(2) LIGHT*(2) sunny*(2) WARM*(2) wash*(2) white*(2) window(2)
COLD	HOT*(33) WARM*(28) freezing*(23) COOL*(21) snow(7) ice(6) winter*(6) chilly(5) freeze(5) froze(4) weather*(4) rain*(2) shiver(2) water*(2) WET*(2)
COOL	COLD*(50) HOT*(37) WARM*(24) freezing*(7) NICE*(4) water*(4) winter*(4) air(2) aircondition(2) boiling*(2) fresh(2) freezer(2) spring*(2) weather*(2)
DARK	night*(38) LIGHT*(37) black*(15) moon*(8) day*(6) BRIGHT*(5) brown(2) CLEAN*(2) green(2) room*(2) scared*(2) stars*(2) sun*(2) sunny*(2)
DEEP	shallow(22) hole(18) water*(15) down*(7) LONG*(6) high*(5) ground(4) BIG*(2) DARK*(2) far*(2) ocean*(2) sea(2) SHORT*(2) steep(2) up*(2) WIDE*(2)
DIFFERENT	SAME*(22) alike*(8) people*(5) STRANGE(5) something*(4) unusual*(4) colors(2) girls(2) kind*(2) NEW*(2) other*(2) things*(2)

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<i>Stimulus</i>	<i>Response</i>
DRY	WET*(44) damp*(7) clothes*(6) water*(6), CLEAN*(5) desert(4) hot*(4) WARM*(4) land(2) soak(2) sun*(2) sunny*(2) weather*(2)
ENOUGH	much*(7) plenty*(7) lots*(6) all(5) MORE*(5) food*(4) FULL*(4) books*(2) eggs(2) had(2) HUNGRY(2) less*(2) not(2) through(2)
EVEN	STRAIGHT*(13) uneven(7) crooked(6) numbers*(5) good*(4) LONG*(4) SAME*(4) fine(2) LARGE*(2) level(2) odd*(2)
FAIR	good*(10) carnival(8) weather*(7) circus(6) cheat(5) fun*(5) game(5) right*(5) honest(4) NICE*(4) animal*(2) chair(2) fairy(2) mean*(2) play*(2) unfair(2)
FAST	SLOW(41) run*(38) running*(11) go*(6) jump(6) play*(5) speed(4) stop*(4) hurry(2) skip(2) swift*(2) quickly(2)
FAT	skinny*(34) BIG*(22) chubby(12) round*(12) medium*(10) LARGE*(7) SMALL*(6) thin*(6) pig(5) LITTLE*(4) boy*(2) dogs(2) man*(2) SHORT*(2)
FEW	MANY*(21) lots*(16) LITTLE*(13) MORE*(8) less*(7) much*(4) several(4) three(4) hundred(2) LEAST*(2) one*(2) SMALL*(2) things*(2)
FINE	good*(24) NICE*(7) well*(7) BAD*(5) PRETTY*(4) SOFT(4) BEST*(2) coarse(2) great(2) okay(2) mine(2) something*(2) thin*(2)
FREE	freedom(4) jail(4) SAFE(4) ABLE(2) caught(2) cost(2) happy*(2) money*(2) OLD*(2) pay(2)
FULL	empty*(20) ENOUGH*(8) eat*(4) fill(4) filled(4) plenty*(4) water*(4) basket(2) FAT*(2) glass*(2) happy*(2) lots*(2) milk(2) overflow(2) top(2) up*(2)
FUNNY	laugh(17) silly(16) clown(11) SAD*(7) laughing(6) fun*(5) happy*(5) giggle(4) people*(4) gay*(2) party(2) smile(2) unhappy*(2)
HOT	COLD*(32) WARM*(28) COOL*(17) sun*(10) boiling*(8) stove(6) burn(5) DRY*(5) fire*(5) burning(4) day*(4) steam(4) steaming(4) sunny*(4) heat*(2) heater(2) sweat(2) water*(2) WET*(2)
HUNGRY	starve(21) food*(17) starving(11) full*(6) thirsty(6) eat*(5) animal*(2) empty*(2) POOR*(2)
HURT	cut(12) injured(10) BROKEN(6) BAD*(5) sore(5) cry(4) skin(4) arm*(2) AWFUL*(2) bleeding(2) crying*(2) feelings(2) good*(2) scratch(2) SICK*(2) unhurt(2)
LARGE	BIG*(56) SMALL*(26) tall*(13) huge*(8) enormous*(7) LITTLE*(7) medium*(7) gigantic*(5) giant*(4) high*(4) round*(4) building(2) FAT*(2)
LIGHT	DARK*(38) BRIGHT*(24) sun*(16) day*(10) moon*(10) night*(6) bulb(5) morning(4) darkness(2) dim*(2) HOT*(2) shiny*(2) stars*(2) white*(2) yellow(2)
LITTLE	SMALL*(60) BIG*(34) SHORT*(16) tiny*(12) tall*(10) LARGE*(8) baby*(7) medium*(6) FAT*(5) midget(2) people*(2) thin*(2) WIDE*(2)

*Stimulus**Response*

LONG	short*(37) tall*(16) big*(12) straight*(7) wide*(7) small*(6) far*(5) large*(5) mile(5) rope(5) skinny*(5) high*(4) thin*(4) fat*(2) line(2) low(2) medium*(2) road*(2) slender(2) stick(2)
LOW	high*(37) small*(20) big*(8) down*(7) little*(6) deep*(5) short*(5) medium*(4) tall*(4) long*(2) mountains(2) skinny*(2) under(2)
MANY	lots*(28) few*(18) much*(10) more*(6) things*(6) less*(5) people*(5) little*(4) large*(2) money*(2) none*(2) numbers*(2) pencils(2) small*(2) toys*(2)
MORE	lots*(16) less*(12) many*(10) enough*(5) little*(5) money*(5) plenty*(4) books*(2) candy*(2) empty*(2) fast*(2) few*(2) for(2) people*(2) poor*(2) want(2)
MOST	lots*(24) more*(16) many*(7) less*(10) little*(5) much*(5) few*(4) least*(4) things*(4) almost(2) enough*(2) none*(2)
NEW	old*(41) pretty*(8) dress*(6) shoes(6) car*(4) shiny*(4) bought(2) boy*(2) bright*(2) girl*(2) good*(2) house*(2) nice*(2) skirt(2)
NICE	good*(32) bad*(16) kind*(13) sweet*(10) mean*(8) pretty*(5) mice(4) polite(4) awful*(2) dog*(2) happy*(2) helpful(2) lady*(2)
OLD	young(30) new*(20) grandfather(6) age*(4) grandmother(4) cold*(2) elderly(2) feeble(2) gray(2) lady*(2) middleaged*(2) people*(2) torn(2) used(2)
POOR	rich(48) money*(10) old*(5) wealthy*(4) house*(2) nice*(2) sick*(2)
PRETTY	beautiful*(43) ugly*(24) nice*(13) handsome(5) beauty*(4) cute(4) gorgeous*(4) lovely*(4) color*(2) dress*(2) funny*(2) girl*(2) hair*(2) look(2) sweet*(2)
QUIET	noisy(23) loud(10) still*(10) library(4) people*(4) listening(2) peaceful(2) talk(2)
REAL	true(10) alive(8) fantastic(4) play*(4) book(2) cat*(2) dead(2) fables(2) fake(2) fiction(2) horse(2) live(2) money*(2) people*(2) right*(2) unbelievable(2)
RICH	poor*(44) money*(23) gold(6) wealthy*(6) lots*(4) people*(4) happy*(2) house*(2) millionaire(2) plentiful(2) pretty*(2) silver(2)
SAD	happy*(33) unhappy*(23) glad*(13) good*(6) crying*(5) joyful(5) mad*(5) sorry(5) bad*(4) gloomy(4) lonely(4) gay*(2)
SAFE	unsafe(7) money*(5) street(5) careful(4) danger(4) dangerous(4) policeman(4) safety(4) bank(2)
SAME	different*(12) alike*(11) like*(6) thing*(6) clothes*(5) dress*(2) one*(2) other*(2) person*(2) twins(2) unalike(2) unusual*(2)
SHORT	small*(32) tall*(28) little*(22) long*(16) big*(11) fat*(10) medium*(6) high*(4) skinny*(4) hair*(2) large*(2)
SLOW	fast*(50) car*(8) walk(7) go*(5) run*(5) medium*(4) pokey(4) stop*(4) down*(2) running*(2) swift*(2) turtle(2)

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<i>Stimulus</i>	<i>Response</i>
SMALL	LITTLE*(49) BIG*(23) tiny*(13) LARGE*(10) tall*(10) baby*(8) SHORT*(7) child*(4) children*(2) doll*(2) FAT*(2) size*(2) skinny*(2) thin*(2)
SOFT	hard(32) fluffy(11) bed(10) pillow(8) smooth(6) feathers(5) cushion(4) kitten(4) rough(4) BEAUTIFUL*(2) furry(2) fuzzy(2) medium*(2) NICE*(2) ugly*(2)
STILL	QUIET*(21) move(11) moving(11) BAD*(2) FAST*(2) read(2) sitting(2) stand(2) water*(2) wiggle(2) working(2)
STRANGE	DIFFERENT*(8) known(6) friend*(5) stranger(5) man*(4) NEW*(4) queer(4) thing*(4) unusual*(4) feeling(2) FUNNY*(2) mysterious(2) odd*(2) person*(2)
STRONG	weak(26) muscles(16) healthy(15) BIG*(11) man*(5) FAT*(4) heavy(4) powerful(4) good*(2) lift(2) LITTLE*(2) men(2) tough(2)
SWEET	NICE*(20) good*(17) sugar(13) sour(13) candy*(10) apple(7) bitter(5) orange(5) BAD*(4) PRETTY*(4) BEAUTIFUL*(2) flower*(2) gentle(2) kind*(2) mean*(2) salt(2) taste(2)
WARM	HOT*(57) COLD*(35) COOL*(12) sun*(7) heat*(5) boiling*(4) sunny*(4) blanket(2) coat(2) DRY*(2) fire*(2) spring*(2) summer(2) water*(2) weather*(2)
WET	DRY*(37) rain*(12) water*(12) damp*(11) rainy(7) COLD*(5) sopping(5) swimming(4) bath*(2) CLEAN*(2) dirty*(2) floor(2) lightning(2) ocean*(2) SICK*(2) soaked(2) soaking(2) thunder(2)
WIDE	BIG*(26) LARGE*(13) LONG*(8) thin*(7) broad(6) FAT*(6) narrow(5) skinny*(5) tall*(5) LITTLE*(4) room*(4) round*(4) SMALL*(4) ocean*(2) open(2) road*(2) width(2)
WRONG	right*(51) BAD*(7) answer(4) good*(4) AWFUL*(2) did(2) shouldn't(2) something*(2)
YOUNG	old*(49) LITTLE*(7) age*(5) baby*(5) boy*(5) NEW*(5) child*(4) girl*(4) middleaged*(4) BIG*(2) cat*(2) dog*(2) NICE*(2) people*(2) SMALL*(2) tall*(2) twelve(2)

RELATION TO PAIRED-ASSOCIATE LEARNING

Two sets of six word pairs (both of which contain common stimulus items) were constructed from the present list. One set consisted of word pairs of high association values, the other of low association values. These pairs are presented in Table 1 along with their association values in percentages.

The words were presented by means of the Hunter Card Master. A 3-sec. anticipation interval during which the stimulus item was exposed preceded a 3-sec. exposure of the response item. There was a 2-sec. interval between exposures of the pairs and 8 sec. between trials. A trial consisted of one exposure of each of the six pairs. In order to prevent the pairs from being learned serially, three different orders of exposing the pairs were employed. The Ss were carried to a criterion of one perfect (errorless) trial or to a maximum of 15 trials.

TABLE I

WORD PAIRS AND THEIR ASSOCIATION VALUES
(IN PARENTHESES)

Stimulus	R E S P O N S E	
	Group I	Group II
ANGRY	mad (61)	kind (1)
BEAUTIFUL	ugly (23)	sorry (1)
BIG	tall (23)	thin (1)
DARK	night (38)	far (1)
FAST	run (38)	high (1)
RICH	money (23)	good (1)

A total of 50 fifth and sixth grade Ss were randomly assigned to one of two groups. Group I consisted of 28 Ss and group II of 22. The list for group I consisted of word pairs of high association values and of low association values for group II.

A precautionary measure designed to identify those Ss unable to read the words comprising the experimental list was employed. The appropriate words were typed in alphabetical order on separate sheets, and the *S* was required to read these words immediately prior to the paired-associate task (see instructions). All Ss read the words without error.

The instructions to *S* were as follows: "This is a game to see how well you can remember. This is how it goes. Here on this side (*E* points to left aperture) a little window will open up, and you will see a word. A few seconds after this window opens, the window on this side (*E* points to right aperture) will open and you will see a *second* word. Your job is to guess what the second word is before its window opens. You say the word out loud so that I can hear you. (*E* hands *S* the words used in the experiment prepared in alphabetical order.) Here are the words that we will use. Would you read each one for me first. Fine, now we are ready to start. Remember, you are to say out loud the second word which is going to appear in the second window before the window opens. In the beginning you will make a lot of mistakes, but as you learn how it goes, you won't make so many mistakes."

RESULTS AND DISCUSSION

In terms of the mean number of trials to reach the criterion of one perfect recitation, the means for groups I and II were 3.4 and 11.0, respectively. The difference between the means was significant at the .001 level ($t = 10.76$). These results indicate that performance in paired-associate learning

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was better where the association values between the stimulus-response items were initially high.

These results suggest that one of the parameters found to be important in work with adults, i.e., associative strength, may be varied in paired-associate learning in children by use of the present list or other lists constructed by comparable methods. The present list, however, is limited in the number of adjectives, and additional research concerned with increasing the number of adjectives in the present list, as well as constructing other lists appropriate in reading level for children in the lower grades, would be desirable. Furthermore, the adaptations necessary for work with this method in child populations of different ages would require research on those variables more immediately connected with the paired-associate method, e.g., anticipation intervals, rates of presentation, presence of competing associations, instructions, length of list, etc. Knowledge of the variables would be useful to studies more directly concerned with other factors, e.g., motivational and personality factors. As indicated earlier, these latter factors have been studied in adult populations with the paired-associate method, and there appear to be no *a priori* reasons why they could not be studied in conjunction with this method in younger populations.

SUMMARY

The present report describes the word associations and the relative frequency with which they occurred in a sample of 82 fourth, fifth, and sixth grade children to a list of 63 common adjectives. Also, two lists composed either of high or low association values between the to-be-learned stimulus and response items were constructed from the standardization list and employed in a paired-associate learning experiment with fifth and sixth grade children. Learning by the anticipation method was found to be significantly better the higher the association values.

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VARIABLES IN EARLY DISCRIMINATION LEARNING:

III. SIMULTANEOUS VS. SUCCESSIVE STIMULUS PRESENTATION^{1,2}

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In a previous study in this series it was found that children had great difficulty discriminating between tones of different pitch (4). It was shown that at least part of the difficulty was due to the response required of *S*. Another condition of particular concern for the present experiment was that of the method of stimulus presentation; the stimuli were presented successively, a response being required to each stimulus.

A number of studies have contrasted simultaneous and successive methods of stimulus presentation in the study of discrimination learning, and a variety of results have been obtained (1, 2, 5, 6). The various procedural differences, as well as stimulus and subject differences, make the interpretation of these results difficult. Inasmuch as Loess and Duncan (5) obtained a difference in learning speed between simultaneous and successive conditions with adult *Ss* when the discrimination was a difficult one, it seemed likely that such a difference would also be found with children. If it could be established that children do find the successive presentation condition more difficult, this would provide the opportunity for studying some of the factors that might be responsible for the difference in difficulty.

The stimulus presentation conditions as used by Loess and Duncan were essentially as follows: when the stimuli were presented simultaneously, *S* was required to approach one or the other stimulus, regardless of its position to the right or left, in order to receive reinforcement. When the stimuli were presented successively, a single stimulus at a time, a different response was required for each stimulus. Thus, this latter condition not only provided less opportunity for comparison of the stimuli but also called for a different type of response from *S*.

Therefore, the present study was designed to test the hypothesis that discrimination learning with successive presentation of the stimuli is more difficult than when the stimuli are presented simultaneously and that this difficulty can be at least partially accounted for in terms of the response called for under the successive presentation condition.

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METHOD

Subjects. Twenty-six children from the Junior Kindergarten of the University Nursery School served as Ss. The children were randomly assigned to three groups with nine each in groups I and II and eight in group III. The mean ages of these groups were 5 years, 4 months; 5 years, 3 months; and 5 years, 4 months, respectively.

Apparatus. The stimuli were square blocks, one with an area of 2.5 sq. in. on a side, and the other with an area of 2.0 sq. in. on a side. An opaque screen shielded the stimuli from S's view between trials. Two push buttons, mounted 14 in. apart on a board 2 in. wide and 16 in. long, could be placed in front of S with buttons to the right or left or one in front of the other. Programming apparatus turned on or continued tape recorded music, used as an incentive, if the correct button was pushed, while pressure on the incorrect button turned off the music. Once off, the music stayed off until a correct response was made on a subsequent presentation of the stimuli.

Procedure. Group I was shown the stimuli successively. A single stimulus was placed between the two buttons which were oriented to the right and left of S. S's task was to learn to press the button on the left for one of the stimuli and the button on the right for the other. The correct response for each stimulus and the one presented first was counterbalanced among Ss. Prior to the training trials, S was shown the blocks separately and E pointed out the correct button for each block without labeling either the blocks or the buttons as indicated in the instructions that follow.

I have two blocks here behind the screen. When I show you one of them, one button will make the music come on, but when I show you the other block, the other button will make the music come on. So, when I show you this block (a block is presented) you should press this button (a button is pointed to) to make the music come on, but (the first block is removed and the second presented) when I show you this block, this button should be pressed (E points to other button). Try to press the correct button each time so you will keep the music on. If you make a mistake the music will go off, but if you press the correct button the next time you can make the music come back on. Look carefully at the blocks so you will know which button to press.

The group II Ss were presented with two stimuli simultaneously but separated by 12 to 13 in. Thus, each block was approximately 1 in. from a button. Their task was to press the button beside the positive stimulus. For four Ss the positive stimulus was the small block, and for five Ss it was the large block. Prior to beginning the training trials, the blocks were placed in the positions indicated above, and the correct button was indicated with the positive stimulus both on the right and on the left; i.e., Ss saw the stimuli in both positions. As with group I, the instructions were given as follows without labeling either the button or the block.

I have two blocks here behind the screen. I am going to place them in front of you, like this (the blocks are presented). In order to make the music

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come on, you must press the button near this block (*E* indicates the block) which would be this button (*E* indicates the button), not the button near this block (*E* indicates the negative block). So this way you would press this button (*E* indicates appropriately) but (*E* reverses the blocks) this way you would press this button (*E* indicates the other button). Try to get it right each time so the music will stay on.

Group III made it possible to evaluate the response factors involved in a successive discrimination and permitted some control of the factor of distance from the stimulus to the response device. Under the condition of simultaneous presentation in group II, *S* made only a simple approach response to the positive block, whereas in the successive presentation in group I, although the response required was physically the same, *S* had not only to discriminate the stimuli but also to learn whether a particular response went with one or the other stimulus. For group III there was only a single button in front of the screen. The stimuli were presented successively 5 to 6 in. behind the button, and *S* was given the following instructions.

I have two blocks here behind the screen. When I show you this block you should press the button to make the music come on, but (the first block is removed and then the second is presented) when I show you this block you should not press the button or the music will go off. Try to get it right each time so the music will stay on.

Look carefully at the blocks so you will know whether to press the button or not. If you make a mistake the music will go off, and you will have to wait for the next block to make the music come back on. Look carefully at the blocks so you will know whether to press the button or not.

The stimuli in all instances were presented at intervals of approximately 8 sec. following the order LRLLRLRR or + - + + - + - -. Training for all groups proceeded to a criterion of 10 successive correct responses. Immediately after reaching the criterion, the *Ss* of each group were then given the following transfer tasks with appropriate instructions for each. Group I was given the original task of group II, and groups II and III were given the original task of group I.

RESULTS

Table 1 provides the median trials to criterion for both the training and transfer tasks for each group. Considering the trials on the first task alone, it should be noted that for group I five of nine *Ss* refused to continue playing at anywhere from 14 to 61 trials, the median being 37 trials. This result has been obtained previously with similarly difficult tasks (3, 4). Of the rest of the *Ss* in group I, one *S* made no errors following instructions and the other *Ss* took 39, 40, and 72 trials to reach the criterion of 10 successive correct responses. The median for these latter four scores is given in Table 1. In contrast to the performance of the *Ss* in group I, no group II *S* failed to learn the discrimination; the range of trials was from 0 to 20. Of the group

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TABLE I

MEDIAN TRIALS TO CRITERION UNDER EACH CONDITION FOR EACH GROUP

Group I			Group II			Group III		
Succ ...	∞	(39.5*)	Sim	3		Succ (r-nr) ...	...	7.5
Sim ...	∞	(10.0*)	Succ	2		Succ .....	...	6.0
Total ...	∞	(58.0*)	Total	9		Total .....	...	17.5

* These medians were calculated for the four *Ss* who met the criterion. The analysis of variance included the *Ss* who failed to reach the criterion.

III *Ss*, one *S* refused to continue playing, but the rest learned the discrimination in from 0 to 31 trials. Thus, all *Ss* in group II and all except one in group III reached the criterion in fewer trials than the median trial at which the five *Ss* of group I refused to continue playing. A Kruskal-Wallis analysis of variance permitted the rejection of the hypothesis of no difference in the sums of rank scores with $p < .05$. The group II — group III difference is not significant.

Probably the most interesting and most rigorous comparison among groups can be made by using the total number of trials for each group to reach the criterion under the successive presentation condition (see Table 1). This means that for group II the trials to, but not including, the criterion with simultaneous presentation, and for group III the trials to criterion with the response-no response successive condition are also included in the total score. Those *Ss* who failed to continue at any point were given a score of infinity. The Kruskal-Wallis analysis of these scores permits the rejection of the null hypothesis with $p < .05$. Further analysis of the differences among individual groups on trials to reach the criterion on the successive presentation task shows a clearly significant difference only between groups I and II ($p < .05$) when the Mann-Whitney *U* test is used. The difference between groups II and III produces a *U* with $.05 < p < .10$. All tests are two tailed.

It is also of interest to compare learning on the second task alone (see Table 1). It should be noted that the group I *Ss* had a median of 10 trials to criterion with the simultaneous condition alone even after training on the successive condition; whereas group II *Ss* had a median of only nine trials to criterion when trials to criterion were combined on both tasks. Thus, the simultaneous condition was not only an easier one on which to learn originally, but in this case the *Ss* who learned the simultaneous task originally were able to learn both tasks faster than the group that learned the successive first could learn the simultaneous task alone. Furthermore, those *Ss* of the latter group who reached the criterion on the simultaneous problem were a selected group of *Ss* in that they were the four who had managed to learn under the successive condition when it was presented first.

DISCUSSION

At first glance, these data lend support to the contention that it is more difficult to learn a successive discrimination than a simultaneous discrimination when the discrimination is difficult. However, a comparison of the performance of the group that learned to respond or inhibit a response (group III) with that of group I, which learned to press buttons to the left or right in the presence of positive and negative stimuli, indicates clear superiority for the former and emphasizes the importance of response variables in such learning. Grice, in a study with rats (2), found no difference in performance between the group which received the stimuli simultaneously and the group which received the stimuli successively. It is important to note that in Grice's successive presentation condition only a single stimulus was presented at a time and *S* was reinforced for running to the positive stimulus and not reinforced for running to the negative stimulus. This condition was somewhat similar to the approach task for group III of this experiment. The fact that groups II and III differed more in their performance on the first task in this experiment than did Grice's two groups may possibly be explained by his use of the more sensitive latency measure of discrimination. His criterion for a correct response was a latency to the positive stimulus less than, or a latency to the negative stimulus greater than, the median latency for a 10-trial block. The criterion in the present experiment was pressing or not pressing the button. Thus, it might be expected that if a latency criterion had been used in this experiment there would have been an even smaller difference between groups II and III. In the final analysis, then, this study tends to support the hypothesis of no difference between the two presentation conditions even with a difficult discrimination, if response variables are relatively well controlled, and the stimuli vary along a simple dimension.

The transfer data are somewhat in conflict with Grice's data which showed greater transfer from successive discrimination to simultaneous discrimination than for transfer in the other direction. The differences between groups are relatively slight, however, in both the Grice experiment and this one.

Unfortunately the subject pool was not large enough to include a fourth group that would have received two large or two small blocks on each trial, with the buttons continued in their left-right orientation. This condition would have maintained the block-button spatial relationships constant for both the simultaneous and successive conditions. It also would have approximated the condition used by MacCaslin (6). The slight difference in instructions between the simultaneous and successive conditions would have remained. Also, the latter successive presentation condition still calls for two responses, e.g., large-right, small-left, as compared with the large-approach of the simultaneous presentation. Thus, it is expected that the performance of such a group would not differ in any major way from group I of this experiment.

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The fact that so many *Ss* in the present study failed to stay with the successive situation when it came first indicates that the discrimination was difficult. These data may also be taken as another indication (3, 4) that one should be careful about accepting failure to learn as demonstrating lack of readiness to learn, when it may only mean less than optimal training conditions.

SUMMARY

This experiment was devised to evaluate the effect of (a) the simultaneous and successive methods of presenting stimuli and (b) the type of response required in the successive discrimination on the acquisition of a difficult discrimination. Also, transfer among methods was assessed. Three groups of five-year-old children served as *Ss*. The simultaneous discrimination, involving pressing the button closer to the positive stimulus which appeared on the left or right, was easier than the successive discrimination when *Ss* were required to push a button on the left to the positive stimulus and on the right to the negative. There was not a significant difference, however, between the simultaneous and successive discriminations when *Ss* in the latter situation were required to push a single button when the positive stimulus was present and not to respond when the negative stimulus was present. Transfer to the two-response successive discrimination was best after learning under the simultaneous condition. Only four of the nine *Ss* learned the discrimination when they were trained first under the successive condition with the left-right response.

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TRANSPOSITION IN THE INTERMEDIATE-SIZE PROBLEM BY PRESCHOOL CHILDREN¹

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Several investigators (e.g., 2, 3) have reported that children tend to transpose in the intermediate-size problem if they possess a concept, such as "middle-sized," that can serve as a mediational mechanism, but otherwise tend not to transpose. However, there is some evidence (1, 4) that children who do not possess such a concept also tend to transpose. The present experiment is a further investigation of this problem.

METHOD

Subjects

The Ss were 36 children from the Iowa Child Welfare Research Station Preschool Laboratory and the Parents Preschool of Iowa City, with CAs from 3 years, 7 months, to 5 years, 4 months. Six additional Ss did not complete the experiment because of failure to reach the learning criterion.

Apparatus

The apparatus consisted of a tray and a screen which could be rotated to hide or reveal the surface of the tray. The stimuli were two sets of wooden blocks, one set used in a pretest and the other used in training and transposition tests. The pretest stimuli were round and painted light green, and the other stimuli were square and black. Within each set each stimulus bore a 1.6 to 1 area-ratio to the next smaller stimulus. The areas varied from about 9 sq. in. to about 96 sq. in. A hole in the bottom of each block could be used to hide the incentive, a marble.

Procedure

At least 10 days before training began, a pretest was given to determine whether *S* possessed the concept of intermediate size. Three round, green stimuli were presented on each of six trials, using different absolute sizes of stimuli on different trials but retaining a constant area-ratio. The *E* named the sizes of the large and small stimuli, and *S* was required to emit a word designating the size of the middle-sized stimulus. The Ss who emitted an appropriate word on at least five of the six trials were assigned to a "concept" group, group C. The other Ss were given six further trials in which they were asked to point to the middle-sized stimulus. The Ss who pointed incorrectly four or more times were assigned to a "no-concept"

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¹ The experiment was conducted while the writer was a research assistant at the Iowa Child Welfare Research Station. The writer is indebted to Mrs. Joan Danskin Kemble, who served as *E* for the pre- and posttests, and to Dr. C. C. Spiker for his many helpful suggestions.

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group, group NC. The remaining *Ss* were excluded from the experiment since their classification was doubtful. Five *Ss* were excluded. There were 18 *Ss* in each group.

The three largest square, black stimuli were used during training trials, and responses to the middle-sized stimulus were rewarded. Training was continued to a criterion of eight correct responses in 10 consecutive trials, using a modified correction procedure in which *E* showed *S* which stimulus he should have chosen, without giving *S* the marble. Six *Ss* were excluded for failing to reach criterion within 54 trials.

Test trials were given immediately after *S* reached the training criterion. Three six-trial tests were given, using the square, black stimuli. In the Near test the stimuli were one step removed from the training stimuli; in the Middle test, two steps removed; and in the Far test, three steps removed. Six subgroups were formed, each taking the three tests in a different one of the six possible sequences. All responses were rewarded during the test trials.

At least one day after the experimental session *Ss* were given a posttest, identical to the pretest, to obtain further information about *Ss*' possession of the concept of intermediate size.

RESULTS

Training Trials

The mean number of trials through criterion was 17.1 (SD = 11.1) for group C, and 24.7 (SD = 15.5) for group NC. The difference was not statistically significant ($F = 2.39$; $df = 1, 24$; $p > .10$).

Test Trials

Table 1 presents the mean numbers of responses to the three stimuli in each of the three tests. The frequency of responses to the middle-sized stimulus decreased with increasing distance between the training and test stimuli and decreased more in group NC than in group C. The Distance effect was reliable ($F = 15.39$; $df = 2, 48$; $p < .001$), but the effect of the Concept variable was not significant ($F < 1.00$), and the interaction between the Distance and Concept variables was not significant ($F = 1.52$; $df = 2, 48$; $p > .20$). There was significantly more transposition in the Near test than in the Middle test ($t = 4.46$)² and in the Far test ($t = 5.09$), but no significant difference between the latter two tests ($t < 1.00$).

The frequency of responses to the largest stimulus increased with increasing distance between the training and test stimuli and increased more in group NC than in group C. The Distance effect was reliable ($F = 15.19$; $df = 2, 48$; $p < .001$), but the Concept effect and the Distance by Concept interaction were not significant (each $F < 1.00$). There were significantly fewer responses to the largest stimulus in the Near test than

² The error terms of the t tests were based on the within-*Ss* error terms of corresponding analyses of variance, and the df of t are the same as the df of the within-*Ss* error term.

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TABLE I

MEAN NUMBER OF RESPONSES TO THE THREE STIMULI ON TEST TRIALS

Stimulus	Group	Near	TEST	
			Middle	Far
Small	C	1.1	1.0	1.3
	NC	0.9	1.5	1.8
Middle-Sized	C	2.9	1.6	1.3
	NC	3.4	0.7	0.5
Large	C	2.0	3.4	3.4
	NC	1.7	3.8	3.6

in the Middle test ($t = 4.89$) and in the Far test ($t = 4.66$), but there was no significant difference between the latter two tests ($t < 1.00$).

The frequency of responses to the smallest stimulus increased with increasing distance and increased more in group NC than in group C, but none of these effects was reliable (Distance effect: $F = 1.66$; $df = 2, 48$; $p > .20$. Concept effect: $F < 1.00$. Distance \times Concept interaction: $F < 1.00$). However, the Distance variable interacted significantly with Subgroups ($F = 3.02$; $df = 10, 48$; $p < .005$). The frequency of responses to the smallest stimulus increased with increasing distance except in the two subgroups given the middle test first; in the subgroup given the sequence Middle-Far-Near the trend was reversed; and in the subgroup given the sequence Middle-Near-Far there was only one response to the smallest stimulus out of 54 responses. These simple effects were not analyzed statistically.

Posttest

Two Ss, one from group C and one from group NC, missed the posttest. All remaining group C Ss were also classified as group C on the basis of posttest scores. Of the 17 group NC Ss who took the posttest, 12 were also classified as group NC on the basis of posttest scores; four were classified as group C; and one was classified as "doubtful." The pre- and posttest classifications were significantly related ($\chi^2 = 16.93$; $df = 1$; $p < .001$). The Ss were reclassified on the basis of their posttest scores, but the group differences were smaller than those in Table I and were not analyzed statistically.

DISCUSSION

The Ss tended to transpose on the Near test, whether or not they possessed the concept of intermediate size, more than on the other two tests. This finding supports the theory (4) that the probability of transposition

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is an inverse function of the discriminability of the training and test sets of stimuli, on the assumption that the discriminability increases as the number of steps between the training and test sets of stimuli increases.

The frequency of responses to the largest stimulus, which was the most similar to the positive stimulus of the training trials, increased as the frequency of transposition decreased, suggesting that, when *Ss* discriminate between the training and test sets of stimuli, they respond on the basis of absolute size.

SUMMARY

Preschool children were divided into a Concept group and a No-Concept group on the basis of a pretest in which they were required to name the middle-sized of three stimuli differing in area. At least 10 days after the pretest, they learned to choose the middle-sized of three other stimuli and were then given test trials in which the stimuli were one step (Near test), two steps (Middle test), and three steps (Far test) removed from the training stimuli.

There was no significant difference between the Concept and No-Concept groups in trials to criterion in the training phase and no significant difference in performance on test trials. Distance effects were obtained, with significantly more transposition and fewer responses to the largest stimulus on the Near test than on the Middle and Far tests, which did not differ significantly from each other. The distance effects did not interact significantly with the concept variable.

The data support the theory that the probability of transposition is an inverse function of the discriminability of the training and test sets of stimuli and suggest that, when *Ss* make the discrimination, they respond on the basis of absolute size.

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A COMPARISON OF SOCIAL BEHAVIOR IN NORMAL AND HYPERAGGRESSIVE PREADOLESCENT BOYS¹

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This paper presents data on the free social behavior of two groups of preadolescent boys of about the same age. The first is a normal group, selected so as not to include any gross psychopathology, and the second is an in-patient group selected as ego-disturbed, hyperaggressive boys as described by Redl and Wineman (7). Both were studied under the same conditions of living arrangements, program, and adult staff. The patients were part of the same group on which observations have been reported elsewhere (5, 6), but the data to be reported here were collected about a year earlier, when the first boys of the group had just been admitted. The normal group was not a control group in the sense of being precisely matched on a number of variables, but were boys admitted partly for staff training and partly for research purposes before the patient group arrived.

The first purpose of the research is to confront theoretical formulations and case reports of hyperaggressive children with actual behavior of these children. Such patients have been extensively described by Redl and Wineman (7) as children whose ego organizations lack control and whose chief reactions take the form of outbursts of rage. The examples given in the books certainly support the formulations of the pathology, and the case materials of our present patients are also replete with illustrations of unmanageable rage in school, family, community. Such case descriptions, however, are necessarily overinfluenced by the more outstanding and colorful

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¹ This study was carried out in the Child Research Branch of the National Institute of Mental Health, and the authors wish to thank Dr. Fritz Redl, then Chief of the Branch, for his support in collecting the observations on which the study is based.

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incidents in which the child has become involved. While it is clear that he has been aggressive enough to have case records written about him in the first place, still it is not clear how much of his aggression is pathological. By systematic sampling of a wider range of behavior, in addition, the data will give a more complete picture of areas of ego strengths and defects. Research which attempts some representation of the child's daily life activities has long been needed as a check on clinical case material.

The second and more obvious purpose of the present study is that of obtaining baseline data on the behavior of normal preadolescent boys against which to cast the observations of our patients. With information on normals, we can draw conclusions, not only about how much of our patients' behavior is pathological, but how much of it represents the islands of nonpathology which treatment agents try to exploit. Data on normals can also help the staff to know which of the new behaviors which appear in the course of treatment can be interpreted as signs of progress. Studies of normal children reported in the literature are of little help for our purposes, since the settings in which the children have been observed, i.e., camps, boys' clubs, and the like, have been so different from the in-patient treatment situation in which our patients find themselves.

Since the present work was an early study in the program as a whole, there were a number of areas in which controls could not adequately be worked out. First, the number of children was greater in the normal group than in the patient group. Second, the normal group was somewhat older and more homogeneous in age than the patient group. Expectations of how these areas might affect the ego controls of the children are opposite: the younger patient group would be expected to have less control than the older normals on the basis of age alone, while the smaller group of patients (with the same size of child care staff) would be expected to provide fewer opportunities for outbursts of rage.

METHOD

The groups under study lived on the nursing unit of the Child Research Branch of the National Institute of Mental Health. This unit is on the fourth floor of the Clinical Center of the National Institutes of Health, arranged so that four bedrooms are at one end and the dayroom for indoor activities and dining area are at the other. Since the observations in this study were made during summer and early fall, much activity took place out of doors, in a private enclosure just outside the building, and on trips away from the grounds. The four social settings in which the children were observed are described below: (a) Meals, mostly in the nursing unit, but occasionally outside; (b) Group Activities, in which the boys as a group, or a majority of the boys, were together, either engaged in a single game or divided into subgroups which were fairly close to each other; (c) Arts and Crafts, where all children were making the same thing, such as model

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planes, Indian headpieces, and the like, with child care staff or occupational therapists available for help and instruction; (d) Snacks, the time after showers, and just before bedtime. About two-thirds of the observations were of the Group Activities setting, which contained a great deal of social interaction.

Observations were done by the method of Rauch and Rauch [described in detail by M. D. Rauch (4)]. Briefly the observer was nonparticipant in the situation and observed the total group of children, plus the child care staff on duty at the time, for a period of time determined by his own judgment of how much he could remember. The average time was a little less than 10 minutes and varied according to the amount of activity and the cohesiveness of sequences of interaction: the time was apt to be short where the children were very active or where there was a series of unrelated interactions which the observer felt would be confusing to remember in sequence. Following the observation, the observer went to an office where an interviewer would try to elicit as complete a picture as possible of the interpersonal events which transpired during the period of observation. This interview was recorded, and the recording served as the basic protocol of coding.²

Each observation was coded for interactions on the Freedman-Leary-Ossorio-Coffey Circle of Ego-oriented Interpersonal Mechanisms (3), using the 16 categories which that system provides and the three degrees of "intensity." The categories are various combinations of the two dimensions of affect (friendly to hostile) and status (dominant to submissive), while the intensity parameter includes uninvolved, appropriately involved, and inappropriately intense levels of behavior. The reliability of the coding in this setting, and of observations as seen through the codes, is reported in detail elsewhere (2). Briefly, the coding of individual interactions is low in reliability, though clearly beyond chance expectations. The reliability of profiles made up of these codings, however, is very high. The ratings of intensity are of relatively low reliability, suitable only for studying group differences. Coding was done only on the Public or Interpersonal Level of the system; our results do not include any data on the Private or Symbolic levels. Profiles were made up for each child, keeping his interactions with other children separate from his interactions with adults of the child care staff and keeping the degrees of intensity also separate. Profiles were also made up of the adults' interaction with the children since we were interested in how constant the adults were in dealing with the two groups of children.

² The method reported here differs from the work of Raush *et al.* (5, 6) in three respects, and the findings are therefore of questionable comparability: (a) the groups were observed as a whole in this study, whereas in later work the observer concentrated in each observation on the behavior of one child plus other people he interacted with—a more feasible task for an observer; (b) rather than the four social settings reported on here, six were used by Raush *et al.* (5, 6) in a balanced setting-by-child design; (c) the interview of the observer, while useful as a training device, was found not to elicit more interactions per observation (2) and was therefore not continued in later studies.

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Results reported here are of total profiles of all children in each group, broken down by degrees of intensity of interaction. There were in all 49 observations of the normal group, comprising 1674 interactions, and 26 observations, 764 interactions, of the patient group.

SUBJECTS

The normal group consisted of eight boys, four white and four Negro, average age 10 years, 3 months; range 9 years, 8 months to 11 years, 2 months. All had just completed fifth grade in public schools. The initial selection was made by school personnel, who based their judgment chiefly on the children's popularity with other children, being careful not to select outstanding leaders or followers, or very bright children, or children especially eager to conform to adult demands for politeness and studiousness, or children either with many behavior problems or with absolutely none. The children did not know each other before their stay at the Clinical Center. After this initial selection was made, our staff observed the children on the playground and in the classroom at school, and, in the case of those who were accepted on this basis, interviews were held with the parents. The orientation for them was that we were interested in having a group of normal children to study in a situation which would later be used to study disturbed children, that we would run a program similar to summer camp activities. The parents were also told that we would like to call on them in the future for brief visits to the Clinical Center. Despite some understandable initial uneasiness on the part of some of the parents, the response was very favorable. The children were formally admitted as normal control subjects and stayed four weeks. Observations were carried out during the second and fourth weeks. The first week was left free to allow the children to get used to the Clinical Center life and to become acquainted with the observers' presence as nonparticipants. These children differentiated the observers very readily from the child care staff and after a few days did not ask observers for help in tasks or for participation in games, even though they were always very friendly to the observers.

The disturbed group consisted of four boys, average age 9 years, 5 months; range 8 years, 2 months to 10 years, 2 months. These were the first four of six boys who have made up the subjects for the main long-term treatment study of the Child Research Branch. Since their selection was based on more stringent criteria, they could not all be admitted at the same time. They are described in some detail in Redl and Wineman (7) and Raush *et al.* (5).

In the interests of comparability of data we tried to collect observations on the patients in the second and fourth week after their admission. The observations extended over a somewhat longer period, however, partly because the children's stay was not brief and partly because extra care had to be exercised to insure that the observers did not interfere with the ongoing

activity program for the boys. They were highly distractable, and the addition of another adult, even a nonparticipating one, could mean a new outburst of rage. It took many weeks for the boys to recognize the observer role as such. During the period covered by this report, the program for this patient group was almost identical with that arranged for the normal group. Neither school nor regular psychotherapeutic interviews had yet been instituted at that time.

RESULTS

Method of Presenting Results

Those findings which are best presented as profiles of the groups' interactions are broken down by degree of intensity and by object of interaction. Intensities are separated for two reasons: (a) we wished to compare the groups in nonextreme behavior in order to be able to assess any qualitative differences in preferred interpersonal response; (b) since there is considerable difference between the groups in intensity of interactions, we wished to control intensity by examining the profiles within each level of intensity. Profiles are separated into interactions toward peers and interactions toward adults. The profiles themselves have been drawn on polar coordinate graphs in which the radial distance represents percentages of frequencies such that the total percentage for each profile equals 100. The radii of the graphs are arranged so that areas are proportional: the area in a sector representing 20 per cent, for example, includes twice that of a sector representing 10 per cent.

Degrees of Intensity of Interactions

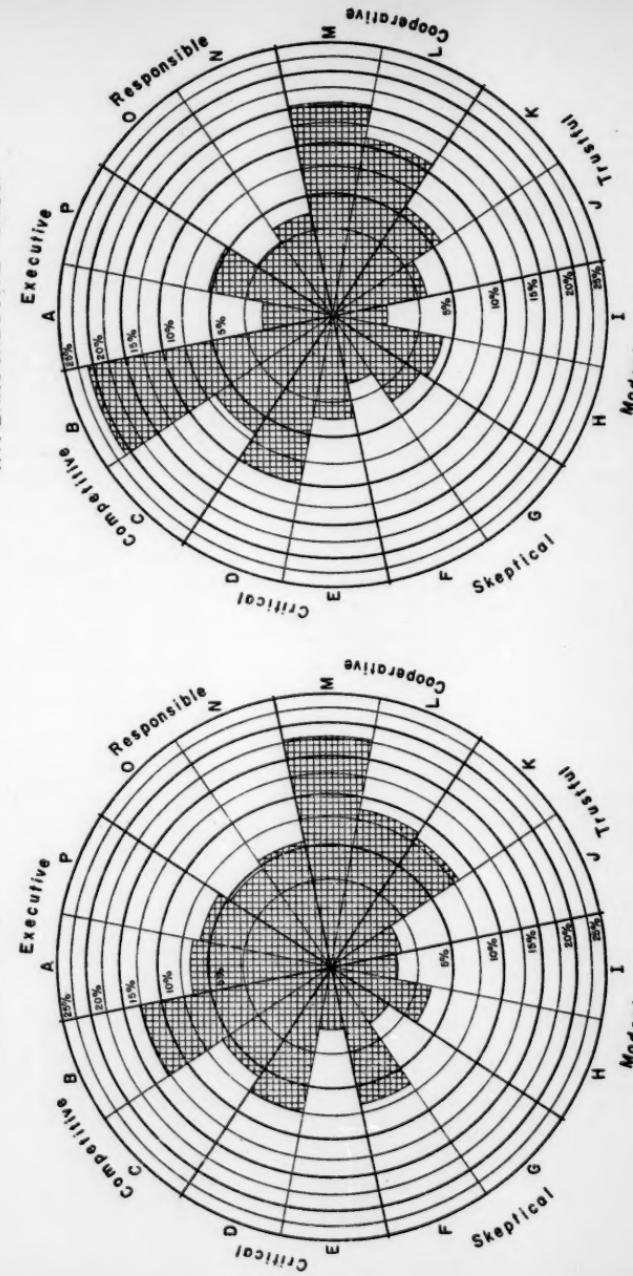
The distribution of interactions by degrees of intensity for the two groups is presented in Table 1. The χ^2 test of these frequencies is 135.16, with 2 degrees of freedom, according to which the hypothesis of randomness may be rejected with greater than .001 confidence.

TABLE I

INTENSITY OF INTERACTIONS IN NORMAL AND HYPERAGGRESSIVE GROUPS

Degree of Intensity	NORMAL GROUP		HYPERAGGRESSIVE GROUP	
	Frequency	%	Frequency	%
1. Noninvolved behavior, appropriate to situation	267	16.0	86	11.3
2. Involved behavior, appropriate to situation ...	1304	78.0	484	63.3
3. Involved behavior, inappropriately intense ...	103	6.0	194	25.4
	1674	100.0	764	100.0

NORMAL GROUP



HYPERAGGRESSIVE GROUP

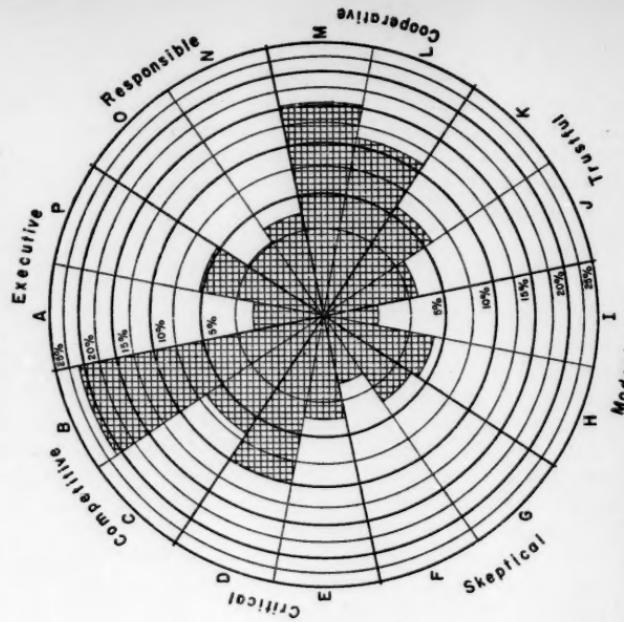
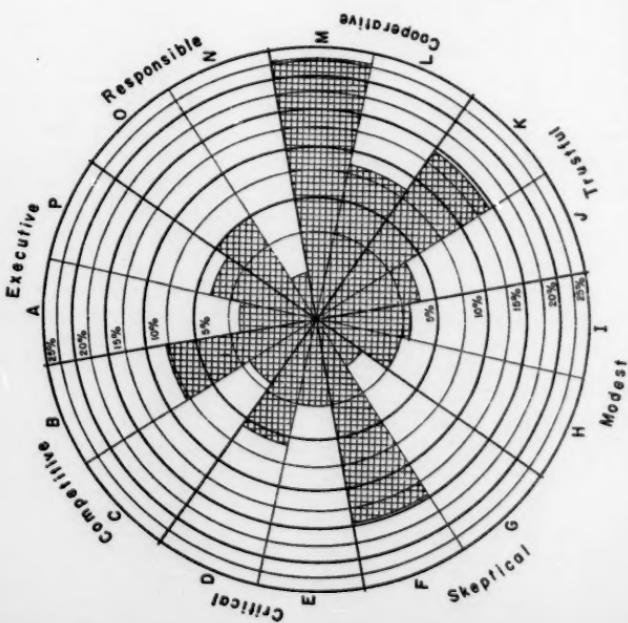


FIGURE 1—Interactions directed toward peers.

NORMAL GROUP



HYPERAGGRESSIVE GROUP

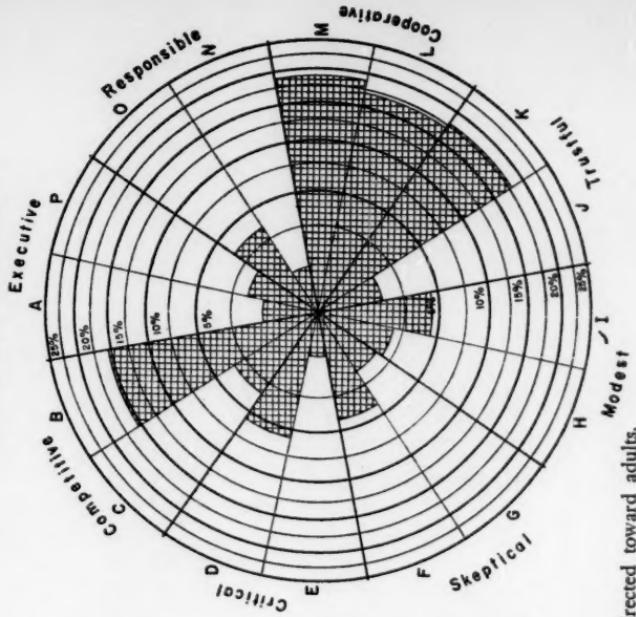


FIGURE 2—Interactions directed toward adults.

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There is certainly nothing surprising in this finding. The greatest difference between the groups as seen in Table 1 is in the inappropriately intense behavior, which made up a quarter of the patient group's interaction in the time observed, and this in a situation where there were plenty of adults, all bent on establishing a psychologically hygienic atmosphere and on building an activities program in which inner controls could grow. Clearly this finding answers the first question of this research: referring agencies have not overemphasized a few isolated instances of high intensity behavior in describing these boys.

The difference between the two groups on this variable is also reflected in the differential reaction to them by the child care staff. Analysis of the intensity of their reactions toward the children also yields differences significant at the .001 level of confidence, though the differences are not so striking as those in Table 1 since the frequency of inappropriately intense interactions is small for both groups: 3 per cent to the normals and 9 per cent to the patient group.

Comparison of Interaction Profiles of the Two Groups

The profiles of the two groups at intensity 2, the involved, situationally appropriate interactions, are presented in Figure 1 and 2, which are profiles of interactions of the children toward peers and toward adults, respectively.

Taking responses to other children first, the similarities between the profiles are immediately apparent, and yet their distributions are significantly different. The χ^2 test of the frequencies of these profiles is 37.07, significant at almost the .001 level. The greatest difference lies in the upper half of the circle: the normal children are friendly in their dominant behavior toward their peers, and the hyperaggressive children most hostile, as is expected from the selection of the groups. A difference which is not so obvious is in the variability of responsiveness. Whereas the patient group's use of the various categories of the Circle are either extremely high or extremely low, the normals' distribution is more evenly spread out on the graph, less characterized by peaks and dips. Thus we see that there is greater differentiation of interaction among the normals and a tendency toward stereotypy among the patients.

The patients show a considerably greater tendency to express themselves in a boastful, challenging, or provocative manner. The normals demonstrate a definitely greater capacity for all types of interaction, for a wider variety of interpersonal expression, and especially for giving appropriate orders and acting helpfully. These leadership behaviors undoubtedly account for the fact that the normal boys required much less adult help in initiating and maintaining constructive group activities and were much more self-directed as a group. Here also is expressed in quantitative terms what we know clinically about the ego of the severely disturbed child, namely that there is less differentiation of capacities for dealing with relationships.

Looking at Figure 2, we see greater apparent differences between the profiles of the groups' interactions with adults than we saw among peers.

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The χ^2 test yields a figure of 61.18, which exceeds the .001 significance level. There are differences in all quadrants, with the normals showing more interactions in the friendly-dominant and hostile-submissive quadrants than the patients. The single category which contributes fully a third of the χ^2 total is F (complains, rebels), in which the normal children contribute far more than expected by chance. This finding is not the result of overweighing one or two childrens' profiles: F was in the first or second rank for five out of the eight children, the lowest rank being 3.5. It should be noted that, even if F had contributed nothing to the total χ^2 , the difference between the two profiles would still be significant at the .001 level. In the matter of variability of responsiveness in interactions toward adults, the hyperaggressive children are again more stereotyped than the normals, though the difference is not as apparent as in the case of interaction toward peers.

Here again the data do not surprise us, in the light of clinical studies. The inability of our patients to express hostile wishes towards adults in a passive mode—as would be appropriate in our culture for the latency child—is based upon their need to maintain active control over any hostile or anxiety-laden aspect of a relationship. Since relationships for these children are usually experienced with the anticipation of rejection, punishment or damaged self-esteem, it becomes especially dangerous to remain passive during a moment of disturbance with another person, especially an adult (1).

Inappropriately Intense Interactions

These are presented in Tables 2 and 3. These are tabulated by octants of the Circle because of the low frequencies in several of the 16 individual categories. In computing χ^2 tests for these tables, even further collapsing is necessary to bring expected frequencies up to workable numbers.

TABLE 2
INAPPROPRIATELY INTENSE INTERACTIONS OF NORMAL AND
HYPERAGGRESSIVE GROUPS TOWARD PEERS

Interaction Categories	NORMAL GROUP		HYPERAGGRESSIVE GROUP	
	Frequency	Per Cent	Frequency	Per Cent
Bossy (A-P)	8	12	5	6
Swaggering (B-C)	19	29	17	19
Combative (D-E)	16	24	28	31
Nagging (F-G)	8	12	9	10
Cringing (H-I)	3	5	5	6
Clinging (J-K)	1	2	5	6
Effusive (L-M)	9	14	17	19
Indulgent (N-O)	2	3	3	3
Total	66	101	89	100

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TABLE 3

INAPPROPRIATELY INTENSE INTERACTIONS OF NORMAL AND HYPERAGGRESSIVE GROUPS TOWARD ADULTS

Interaction Categories	NORMAL GROUP		HYPERAGGRESSIVE GROUP	
	Frequency	Per Cent	Frequency	Per Cent
Bossy (A-P)	6	16	1	1
Swaggering (B-C)	3	8	29	28
Combative (D-E)	16	43	36	34
Nagging (F-G)	3	8	11	10
Cringing (H-I)	0	0	4	4
Clinging (J-K)	5	14	7	7
Effusive (L-M)	3	8	16	15
Indulgent (N-O)	1	2	1	1
Total	37	99	105	100

The difference between the profiles in Table 2 can be expected about 30 per cent of the time by chance, but those in Table 3 less than 0.1 per cent. The main differences in the behavior toward adults lie in the proportions of responses in the friendly-dominant quadrant (A-P and N-O) where the normal group shows high frequencies and to some extent also in the hostile-passive quadrant (F-G and H-I) where the hyperaggressive group contributes more than its expected share. The profile differences between intensity 2 and 3 behavior are statistically significant for both groups although the differences are more marked for normals and patients alike in the case of their interactions with adults.

Of particular interest theoretically is this finding that these patients tend to express their most intense psychopathology more with adults than with their peers. Redl and Wineman (7) and others have long recommended that treatment with these children should begin within a peer group activity setting since these children find it easier to form relationships with peers. With adults, particularly with interested warm adults, intense anxieties about the fantasized dangers believed by the child to be inherent in such trusting dependent closeness are mobilized and acted out. In part, the difference in locus for the expression of psychopathology in these patients can be accounted for by their failure in superego maturation. Normally in this developmental phase, the child identifies sufficiently with the "good authority" aspects of the parent to displace more and more of his anxieties into the peer-group and sibling relationship arenas. (This is borne out in the normals' greater amount of inappropriately intense behavior to peers than adults.) With hyperaggressive, or other children with severe developmental

personality defects, the tendency is to maintain the experience of anxieties directly with the parental surrogate.

Uninvolved Low Intensity Interactions

Behavior at level 1 of the intensity scale is rare in the patient group, and comparisons are therefore impossible to carry out in parallel to the findings reported above. The profiles of interaction of the three intensities are, however, very similar in both groups, with the interesting exception among the normals of levels 1 and 2. The hostile-dominant behavior of the normals tends to be uninvolved, while their passive-friendly behavior tends to be involved.

Adult Interaction toward the Two Groups

The profiles of the child care staff's interactions to the two groups of children have been computed only at intensity 2, the frequency of their intensity 3 behavior being too small to handle statistically. In general, about two-thirds of their behavior falls into the friendly-dominant quadrant of the circle, as their role dictates. Indeed, about a fifth of their interactions fall into each of the categories A (commands, directs) and O (offers, helps). When the adults' behavior toward the two groups of children is compared, the difference is significant at about the .05 level. The chief differences lie in the most friendly and most hostile octants of the circle, and in both of these their behavior toward the normals exceeds chance expectations. This finding is in line with their spontaneous comments on the differences between their tasks in dealing with the two groups: with the normals the adults could relax, be more spontaneous in reacting to the children—these healthy children did not keep grudges and did not hold past favors over one's head to try to extract future privileges. With the patient group, on the other hand, the child care staff had to be cautious, because the children were so changeable and panic or tantrums were frequent enough to lead the adults to exercise tighter control, not only on the children, but also on their own expressiveness.

DISCUSSION

In general, both quantitative and qualitative differences between our groups of normal and hyperaggressive preadolescents confirm past clinical observations and theoretical constructions—the hyperaggressive boys are indeed more aggressive, more stereotyped in their behavior, and less controlled. We should note, however, in looking at the profiles, that there is also considerable similarity in their interaction profiles. We would hope that our research would show the patients' resemblance to other boys, despite their differences from normal ones their age.

There are a few surprises in the data. For example, clinicians familiar only with the literature on these disorders, literature which expresses the

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rage and destructive content of these children's behavior, may be surprised at the large amount of often intense warmth and friendliness (coded M) in the patient group profile. True, the child care workers who lived with them found this friendliness difficult to trust and did not respond to it as freely as they did with the normal group. But it is friendliness just the same and represents one of the areas of possible contact with these children, like the children's need for activity and vigilance about fair play, which treatment programs seek to exploit. But the patients' relative lack of helpful and supporting warmth (coded O and N), as well as the decided absence of true leadership qualities (coded A), as compared with the normals, must be considered an ego defect in its own right, not just an "acting out of unconscious conflict." Even without the aggressive components of their behavior, the lack of these qualities would make it hard to live with these children.

Perhaps the most unexpected finding is the relatively low frequency of overt attacking behavior (coded E) in these patients—very similar to the amount shown by the normals. There were, to be sure, marked differences in the intensity of attack in the two groups when they did display direct aggression, but pure attack was rare. The fact that many of the observations were taken during group activities, a setting which seemed often to evoke competitiveness, narcissistic wounding, and rage in our patients, makes the low frequency of direct attack doubly surprising. Perhaps the best explanation is the degree to which the adult child care workers were conscious of their therapeutic responsibility to prevent and absorb the hatred of these boys. Considerable time was devoted to designing a program which could drain off aggression in structured ways, through games and other activities.

SUMMARY

Two groups of preadolescent boys, eight well-functioning normals and four hyperaggressive patients, were studied by observation of free social behavior in the identical living situation, adult personnel, and programmed activities. While there is similarity between the groups, the differences in a number of areas were striking:

1. The hyperaggressive group showed more intensity of interaction than the normals.
2. In quality of normally involved interaction toward peers, the patients were more hostilely dominant and less dominant in a friendly, supporting way than the normals.
3. Toward adults the patients were also more hostilely dominant and less friendly dominant than the normals. The normals, on the other hand, were more hostilely submissive to the adults than were the patients.
4. In inappropriately intense behavior toward peers, the two groups were very similar. Toward adults, however, there were strong differences: intense reactions of the normals were at once more friendly-dominant and more hostilely-submissive than the patients.

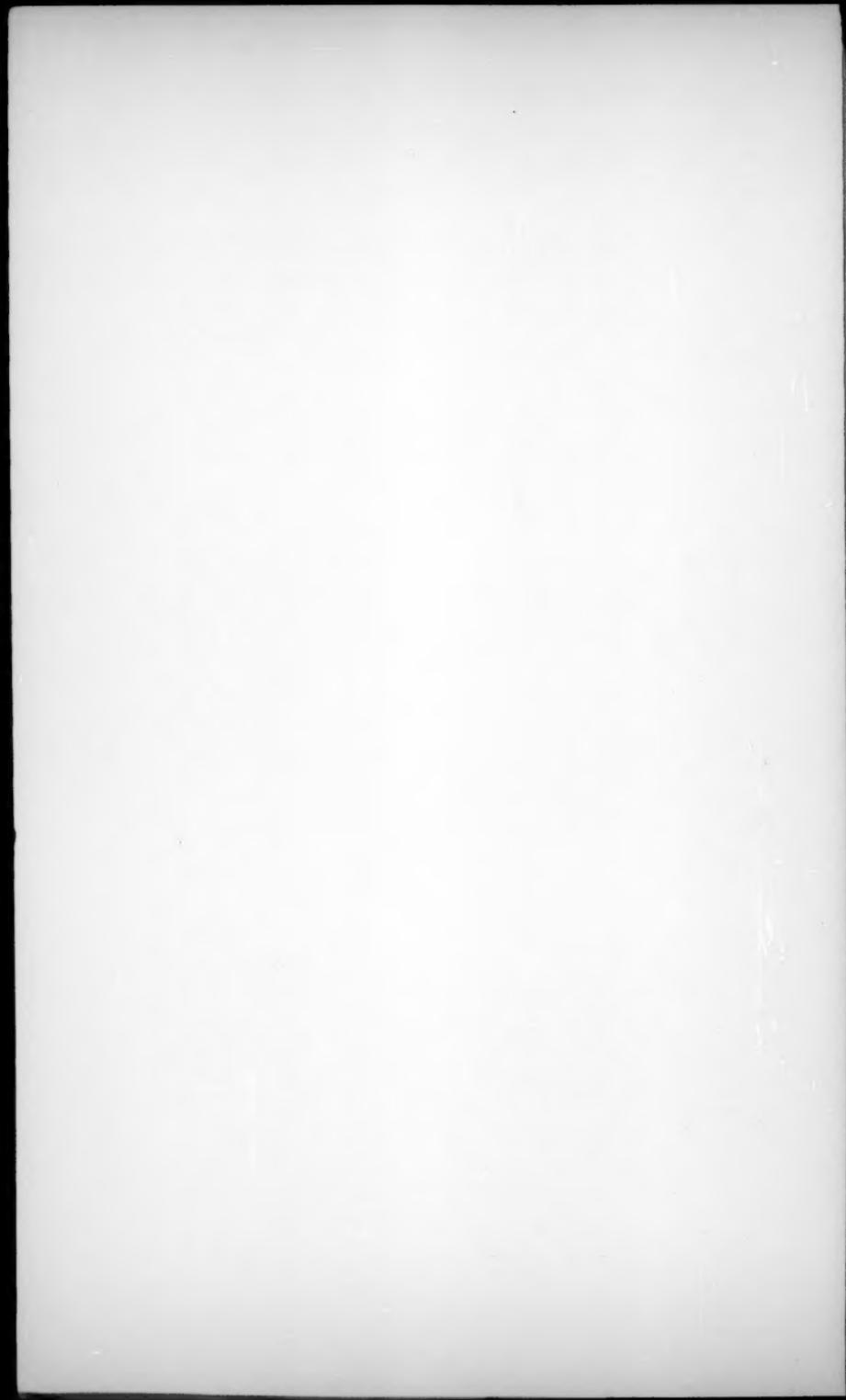
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5. The patients' behavior was rather stereotyped, with a few categories accounting for a large proportion of their interactions, while the normals used a wider repertoire of behavior.

6. Adults' behavior toward the two groups was much less different than the groups were from each other, most of their behavior being role-appropriate helping, supporting, and leading. The small amount of inappropriately intense interactions they displayed was directed more toward the patients than toward the normals. As regards appropriately involved behavior, the adults were more frankly hostile and friendly toward the normals and more controlled in dealing with the patients.

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INTERACTION BETWEEN VERBAL AND NONVERBAL BEHAVIOR¹

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Experimental investigations on the relation between verbal and nonverbal behavior date back as far as Lehmann's study (5) on the effect of verbal labels upon discrimination. Since then, research has been oriented around discrimination learning, generalization, transfer, transposition, problem solving, etc. Thus, previous research on the relation between verbal and nonverbal behavior has been frequently tied in with traditional areas of psychological inquiry where most often the nonverbal behavior has been employed as an index of the effect of verbal behavior on a hypothesized basic process, such as discrimination. The conceptual formulations designed to cover the empirical findings have been primarily concerned with the cue properties (or discriminative stimulus properties) of the two kinds of behavior—the two behaviors have been thought to interact in so far as one provides discriminative stimuli for the other. Esper states this interaction in a broad formulation: "the stimuli associated with each type of response are among the conditioned elicitors of the other . . ." (2, p. 446). A similar paradigm is employed by Kurtz and Hovland (4) to deal with the more specific problem of the effect of verbal behavior on discrimination; they apparently conceive of the effect as due to attending behavior elicited by the verbal response. Miller's (7) formulations on acquired equivalence and distinctiveness of cues similarly rely on the cue properties of the verbal behavior in effecting a change in nonverbal behavior. Indeed, all mediational hypotheses assume that it is the cue properties of the (hypothetical) verbal response that provide the "connecting link" to other behaviors.

In so far as one is concerned with the effect of verbal behavior on specific problems such as discrimination learning and concept formation, one can

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perhaps adequately conceptualize the relations observed by considering only the stimulus properties of the verbal behavior. It is apparent that in so doing one limits oneself to only one of several possible interactions between the two behaviors. It is, for example, conceivable that the two classes of behavior could interact on the basis of having common reinforcing stimuli, common emotional states which influence either behavior, etc. An analysis in these terms becomes more appropriate when one deals with broader classes of verbal and nonverbal behavior, for example, if one deals with social behavior, as in the study to be reported.

The purpose of the present study was to determine the effect of strengthening one class of verbal responses on a class of nonverbal responses. A bar-pressing response reinforced by aggressive doll action was observed immediately after a verbal conditioning session during which one group of children was reinforced for emitting aggressive verbal responses and the other group was reinforced for emitting nonaggressive verbal responses.

METHOD

Apparatus and Subjects

The research was conducted in the laboratory of the Gatzert Institute of Child Development. One room, the observation room, was equipped with one-way mirrors and sound equipment. The *E* (experimenter) could present the various experimental treatments from this room without being observed by *S* (subject). The other room, the "playroom," contained the apparatus or toys with which *S* would play and a partition behind which *A* (an adult assistant) could sit.

There were three pieces of apparatus in the playroom. Two of these, the doll apparatus and the ball-toy, have been described earlier (6). Briefly, the doll apparatus, or "striking dolls," was arranged so that each depression of a lever in the box on which the dolls were placed would make one doll strike the other on the head with a stick. The ball-toy consisted of a ball within a cagelike structure; the ball could be flipped up and down inside the cage by depression of a lever at the base of the cage. Depression of these levers also activated electric counters. The two were placed on a table, enabling *S* to operate both simultaneously.

The third piece of apparatus was a "talk-box," a 15 by 12 by 12 inch wooden box, placed on a table at the opposite wall from the table containing the dolls and the ball-toy. A microphone, inside the talk-box, was wired into the observation room and enabled recordings of *S*'s verbalizations on a Gray Audograph recorder. Two dolls were fastened in a sitting position on top of the box. These dolls originally were similar in appearance, but one, "the bad doll," had been made very dirty; the other doll, "the good doll," was neat and clean. Reinforcement, in the form of small trinkets, could be delivered automatically to *S* through a chute emptying into a small tray on the side of the talk-box.

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The *Ss* were children from the Institute's Nursery School. They were above average in intelligence (1). Nineteen children, age 3-5 to 4-7, were randomly selected from this group (but *Ss* known to be uncooperative were not asked). Five *Ss* were eliminated during the experiment, two because they expressed definite desire to leave, two others because they failed to respond to the verbal conditioning procedure (one could not be differentially conditioned, the other did not respond verbally at all), the fifth one because he had an identical ball-toy at home. The remaining 14 *Ss* had experiences as *Ss* in other experiments, but had no previous contact with the apparatus employed in this study. The *Ss* were seen in the morning while they were engaged in free play.

Procedure

A, a female adult who had visited the nursery prior to the experimental run and acquainted herself with the children, invited *S* to the playroom to "play some games." *S* was first made briefly acquainted with the playroom and then introduced to the striking dolls and the ball-toy. *A* pressed the lever on the dolls once and said, "When you press this bar (demonstrates) this (pointing) will happen. Now you do it (*S* is induced to press the lever five times). Now look here (pointing to ball-toy), when you press this lever (demonstrates) this (pointing) will happen. Now you do it (*S* is induced to press the lever five times). Now you play with the toys while I sit in my chair." *S* received a three-minute period of play, timed from the *S*'s initial depression of either lever. This period constituted the pre-experimental or operant level of behavior for the striking dolls and the ball-toy.

A returned on signal by *E* and placed the dolls and the ball-toy out of *S*'s view. She then seated him in front of the talk-box and said, "This is a talk-box; when you talk to this box, it will give you toys right here (points to reinforcement tray). Now see here are two dolls. This (pointing) is the good doll; this (pointing) is the bad doll. Say 'good doll' (if necessary coaches *S* to say, 'good doll'; this response is reinforced). See what you got; this is your toy; you can keep it. Now say, 'bad doll' (coaching if necessary; this response is also reinforced). See what the box gave you; this is your toy to keep. Now you sit here and tell the box all about the dolls; tell the box what is going to happen to the dolls." The dolls were included to give *S* discriminative stimuli for emitting aggressive or nonaggressive verbal responses. Additional instructions were needed for about one-fourth of the *Ss* equally distributed between the groups. If, after two minutes and again after four minutes, *S* had made no response that could be reinforced, *A* told him from behind her screen: "Say, 'good doll' (*S* is reinforced for saying this); now say, 'bad doll' (also reinforced); now talk about the dolls."

The *Ss* were divided into two groups of seven each. One group was reinforced for aggressive verbal behavior (AV-group), the other for verbal behavior other than aggressive (NAV-group). The criterion used for

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deciding whether a verbal response was aggressive or not was whether it was derogatory to the dolls or denoted a wish on the part of the child to damage or hurt the dolls. In fact, the only responses the AV-group emitted that fulfilled this criterion were: "bad doll," "dirty doll," and "doll should be spanked."

The *Ss* from the AV-group and the NAV-group were matched in pairs on sex, age, number of reinforcements, and length of the verbal conditioning period. The magnitudes of the last two variables were determined by the AV-member of each pair who invariably was run first.

The verbal conditioning procedure necessitated initially reinforcing both aggressive and nonaggressive verbal responses (e.g., "good doll" and "bad doll") for both the NAV- and AV-groups to produce a high rate of verbal responding. A high rate of responding was defined as at least 12 reinforceable verbal responses within any two-minute period. A reinforceable verbal response was any word, phrase, or sentence. The criterion of high rate was reached from two to eight minutes after initiation of the verbal conditioning period. Once the high rate was reached, the AV-group became selectively reinforced for aggressive verbal responses while the NAV-group was reinforced for verbal responses other than aggressive ones. In the NAV-group, affectionate responses were reinforced as little as possible. If "good doll" reached a high rate, reinforcement was withheld in order to extinguish this response and produce other verbal responses. This condition was introduced to insure that any difference in subsequent play behavior between the two groups would not be a function of a contrast between "aggressive" and "friendly" verbal responding, but rather between aggressive and nonaggressive responding ("friendly" verbal responses could be incompatible with subsequent aggressive behavior, hence the data would be less clear than otherwise).

The length of the conditioning period was determined by *S* in the AV-group. The period was terminated after six minutes once a high rate of aggressive verbal responses was established (not less than 20 reinforceable aggressive verbal responses in a three-minute period). Thus, the conditioning period lasted anywhere from six to 14 minutes.

When the conditioning period was terminated, *A* told *S* that the "talk-box" did not work any more, helped him put his trinkets in a paper bag, and told him: "I will keep these toys for you while you play some more with this (pointing to the striking dolls) and this (pointing to the ball-toy) for just a few minutes more." The child was then allowed to play with the striking dolls and ball-toy for a period of four minutes. At the end of the four-minute period, *A* came out, gave *S* a thank you and his trinkets, and accompanied him back to his nursery school group.

A interacted with *S* in a matter-of-fact manner. She remained behind her partition except when she introduced apparatus. She did not interact with him unless he came over to her chair, at which point she said: "I'll sit here and you be over there for a few minutes more."

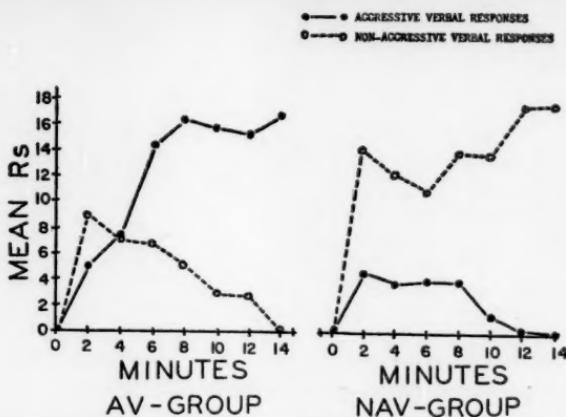


FIGURE 1—Mean number of aggressive and nonaggressive verbal responses over successive two-minute periods in the verbal conditioning period. Aggressive verbal conditioning group presented separately from the nonaggressive verbal conditioning group.

RESULTS AND DISCUSSION

Changes in the verbal behavior as a function of the verbal conditioning are presented in Figure 1. Number of aggressive and nonaggressive verbal responses was summed and averaged over successive two-minute periods for the various *Ss*; the average aggressive and nonaggressive verbal responses for each group are presented in Figure 1. Since some *Ss* reached the criterion of adequate verbal conditioning after six minutes, the last two-minute intervals give the verbal responding of decreasing numbers of *Ss*. Thus, Figure 1 is only an approximate presentation of the changes in verbal behavior. The figure indicates that both objectives of the verbal conditioning were affected: first, there is an initial increase in rate of responding, and secondly, there is subsequent differentiation of aggressive and nonaggressive verbal responses. It should be noted that these *Ss* emitted a very limited range of verbal responses. This was particularly true of the AV-group which in general was limited to "bad doll" or "dirty doll."

The effect of the verbal conditioning on the subsequent play behavior was calculated by taking the total number of responses for each *S* on the striking dolls and the ball-toy and converting this into the following score: $100 \times \text{total responses on the dolls} \div \text{total responses on dolls and ball}$. This percentage gives the relative amount of aggressive play behavior and was calculated for each *S* both before and after the verbal conditioning pro-

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TABLE I

MEAN PROPORTION OF AGGRESSIVE RESPONDING BEFORE AND AFTER VERBAL CONDITIONING

	<i>Before Verbal Conditioning</i>	<i>After Verbal Conditioning</i>
Aggressive conditioning	55.2	78.4
Nonaggressive conditioning	55.4	59.4

NOTE.—Proportion = $100 \times$ total Rs on doll / total Rs on doll + ball.

cedure. The group means are presented in Table I. As can be observed, the level of aggressive responding prior to the verbal conditioning is identical for the two groups. There is a significantly higher proportion of aggressive play behavior following the verbal conditioning period for the AV-group Ss who were conditioned to make aggressive verbal responses ($t = 2.326$, $df = 12$, $p < .05$, two-tailed test). In other words, some control of non-verbal aggressive behavior was achieved by manipulating the children's verbal aggressive behavior.

In evaluating these results, four possibilities should be considered. First of all, the aggressive verbal response, since it is reinforced and not punished, becomes a discriminative stimulus which marks the occasion when non-verbal aggressive behavior will be reinforced, or at least not punished. In popular terms, the aggressive verbal behavior provides a "green light" for subsequent aggressive nonverbal responding.

The second interpretation to be considered deals with the reinforcing stimuli held in common by the verbal aggressive and the nonverbal aggressive behavior. The common reinforcing stimuli may be primary (e.g., tension reduction) as well as secondary (e.g., other forms of self-stimulation). Frequently it appears that in everyday life verbal behavior achieves consequences similar to those of nonverbal behaviors (e.g., both may achieve the removal of some noxiously stimulating person); hence one would expect them also to have numerous secondary reinforcers in common. To the extent that the two response systems have reinforcing stimuli in common, it would be unlikely that an operation upon one system would not also change characteristics of responding in the other system. Both an increase and a decrease could be brought about in subsequent aggressive nonverbal behavior depending upon the operations on the verbal aggressive behavior. For example, one should be able to bring about a "sensitization" for aggressive reinforcers by presenting these briefly to the verbal mode of responding. This sensitization should bring about a subsequent increase in nonverbal responding for that reinforcer. This may well account for the effect observed in the present study. Insofar as the reinforcing stimuli are common between the two response systems, it also should be possible to "satiate" the organism on the reinforcer by presenting it amply for the one mode of responding,

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whereupon one would observe a subsequent decrease in responding for that reinforcer by the other mode of responding. The possibility of reducing nonverbal aggressive behavior by providing frequent and intensive verbal aggressive expression has been long recognized in clinical psychology, usually referred to by such terms as "cathartic expression." There is experimental evidence which supports this notion; for example, Feshbach (3) observed a decrease in aggressive behavior immediately following the writing of aggressive TAT stories.

The third manner in which verbal and nonverbal behavior may be seen to interact attributes to the verbal behavior a "directing" influence upon nonverbal behavior. This formulation presupposes that in the history of the person certain verbal and nonverbal behaviors have occurred together in such a manner that the verbal response becomes a discriminative stimulus for the nonverbal behavior.⁸ This formulation may lead one to expect that one can vary the amount of generalization from verbal to nonverbal behavior by varying the degree to which the verbal behavior denotes the nonverbal behavior. For example, one would be led to expect more generalization than was observed in this study if the children in the AV-group had been reinforced for "doll should be spanked." This hypothesis is supported by observation of the behavior of some of the *Ss* in the NAV-group. For example, one of these *Ss* was reinforced for "what shall I say?" As this response increased in frequency with reinforcements, *S* got up from his chair and walked toward *A* to address his question to her.

Fourth and lastly, it is assumed that aggressive behavior has been associated with aversive stimuli in the past history of the child. It is conceivable that the occurrence of the verbal aggressive response allows for some extinction of the conditioned aversive stimuli associated with that response and that the effect of this extinction generalizes to the nonverbal response. If conditioned aversive stimuli suppress or inhibit aggressive responding, the effect to be expected would be an increase in subsequent nonverbal aggressive responding. In view of the resistance of aversive stimuli to extinction, this relationship is perhaps the least likely explanation of the present data.

SUMMARY

The purpose of the present research was to determine the effect of strengthening one class of responses on another. A bar-pressing response reinforced by aggressive doll action was observed immediately after the children had undergone a verbal conditioning session during which one group of children was reinforced for emitting aggressive verbal responses; the other group was reinforced for nonaggressive verbal responses. The

⁸ Informal observation on the *Ss* while they were being verbally conditioned further confirms that such behavior was being emitted; many *Ss* in the AV-group raised their voices and became quite loud, thrashed around, pounded the table, etc.

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results of the study gave evidence for an increase in aggressive nonverbal behavior following reinforcement of aggressive verbal behavior. In other words, some control of nonverbal aggressive behavior was achieved by manipulating verbal aggressive behavior.

In evaluating these results, four possibilities should be considered: (a) the verbal aggressive behavior becomes a discriminative stimulus which marks the occasion when nonverbal aggressive behavior will be reinforced or at least not punished. (b) To the extent that the two response systems have reinforcing stimuli in common, operating upon one system might also change characteristics of responding for these stimuli by the other system (e.g., by sensitization of or satiation for the common reinforcer). (c) The verbal response has a "directing" influence on the nonverbal response since it functions as a discriminative stimulus for that response. (d) Occurrence of the verbal aggressive response allows for some extinction of the conditioned aversive stimuli associated with that response; the effect of this extinction generalizes to the nonverbal response and thereby reduces the amount of aversive stimuli inhibiting the nonverbal aggressive responding.

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SIMULTANEOUS AND SUCCESSIVE DISCRIMINATION LEARNING IN CHILDREN^{1,2}

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In discrimination learning with infrahuman organisms, two procedures for the presentation of the stimuli to be discriminated are available. In a discrimination problem to be learned in a T-maze or a Lashley jumping apparatus and involving a black and a white stimulus, for example, the "simultaneous" procedure involves the presentation of a black and a white stimulus on each trial with position counterbalanced. The "successive" procedure entails presentation of only one of the discriminative stimuli on each trial. The reinforced responses in the simultaneous situation might be going left to black in a black-left, white-right arrangement and going right to black in a white-left, black-right arrangement. Approach to black, therefore, would consistently result in reinforcement. The reinforced responses in the successive situation might be going right to a black presentation and left to a white presentation.

Spence (7) has described simultaneous discrimination learning as resulting from the strengthening of response to the reinforced component of the stimulus complex until it attains sufficiently greater strength than competing incorrect response tendencies to result in consistently correct choices.

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² This research was supported initially by a Grant-in-Aid from the Sigma Xi - RESA Research Fund and subsequently by a National Science Foundation grant. The writer is indebted to Mr. Albert F. Ehnes, Superintendent of the Seekonk, Massachusetts, Public Schools, and to Mr. Edward Fitzgerald, Superintendent of the Bristol, Rhode Island, Public Schools for their cooperation and to the principals and teachers who helped make these studies possible.

Spence (8) has also said that the successive problem can be solved as a patterned discrimination, i.e., by *S*'s approaching certain patterns or combinations of reinforced stimulus components, while response to other patterns is not reinforced. He suggested that on this basis the successive problem should be more difficult than a simultaneous learning problem involving the same stimuli, because the stimulus compounds to be discriminated on each trial are more similar than in the simultaneous problem, and he presented evidence for this proposition from rat studies.

Not all infrahuman studies have supported the contention that simultaneous stimulus presentation produces faster learning than successive presentation. Several studies have suggested that at least under some experimental circumstances successive provides better performance than simultaneous stimulus presentation (1, 2, 9). In general, however, those experimental instances in which successive proved easier than simultaneous learning have involved a different kind of response than those characteristic of the T-maze or typical Lashley jumping situation. When the animal is required to "orient towards and approach the stimulus complex (path, door, alley, window) containing the positive stimulus cue (white, form, etc.) . . ." (8, p. 89), simultaneous stimulus presentation tends to result in better discrimination learning than successive. When the animal is required, however, to make a response to a locus removed from the stimulus source (1, 2, 9), it is not unusual for successive to prove either equal to or easier than the simultaneous problem. Furthermore, the relative difficulty of the simultaneous and successive problems has been reported to be influenced greatly by the similarity of the stimuli to be discriminated (1, 3, 4, 8).

The studies reported here investigate the relative discrimination learning performances of children under the simultaneous and successive stimulus presentation procedures, varying the nature of the response required and stimulus similarity.

EXPERIMENT 1³

Experiment 1 involves a learning situation for children in which the to-be-learned responses are to loci (buttons) removed from the stimulus sources (the windows or apertures).

Method

*Apparatus.*⁴ The apparatus was a black plywood box, 12 in. high by 12½ in. deep. The front panels were 25¼ in. wide. There were three

³ This experiment was reported at the meetings of Eastern Psychol. Ass., Philadelphia, April, 1958.

⁴ The apparatus, financed by the Ruth Holton Memorial Fund, was constructed while the writer was at the Iowa Child Welfare Research Station. Thanks are due Mr. John Peterson, who aided in its construction.

stimulus apertures each faced with a milk glass window on the upper panel and three response buttons on the lower panel. Distance from the three stimulus apertures to their respective response buttons was $6\frac{1}{2}$ in. Behind each of the windows were five different colored bulbs (GE C-6 Series type) set in a metal reflecting unit. Three selector switches, one for each window, were situated at the back of the apparatus where *E* could preselect which color would appear in each window. Another selector switch enabled *E* to preselect which of the three buttons would be correct on each trial. A jeweled reflector light, located just above the middle button, would be activated when *S* pushed the correct button. A toggle switch activated the entire circuit so that (a) the preselected lights came on in the three windows and (b) response to the appropriate button would turn out the stimulus lights and activate the signal light, while wrong responses would merely turn out the stimulus lights. Thus, correction on the part of the *S* was not possible. The buttons were attached to $1/16$ in. metal rods which passed through small holes in the response panel, each rod meeting a microswitch inside.

Subjects and Design. The *Ss* were 40 fourth grade children obtained from the Bristol, Rhode Island, Public Schools and randomly assigned to one of four groups. Half of the total number of *Ss* were administered a simultaneous discrimination learning problem, and half a successive discrimination problem. Half of the *Ss* in each of these groups were run in a "similar-stimulus" condition, and half in a "distinctive-stimulus" condition. For the similar stimulus group, the colors were red, pink, and blue. For the distinctive stimulus group, the colors were red, green, and blue. On the assumption that red and pink are more similar physically than red and green, it was presumed that a greater amount of generalization would occur for the similar stimulus group, thus retarding learning involving these stimuli.

Procedure. A three-stimulus, three-response procedure was employed for all *Ss*. Half of the *Ss* were administered the simultaneous procedure, and half the successive stimulus procedure. The manner of stimulus presentation for the simultaneous and successive conditions closely follows procedures used in infrahuman investigations of two-stimulus problems. An *S* under the simultaneous condition was presented with the three stimuli exposed together, one in each aperture. Response to the button under one of these colors was consistently followed by the onset of the reward light, while response to either of the other buttons on that trial was not.

The order of stimulus presentation was the same for all *Ss* under the simultaneous condition, and the successive order was the same for all *Ss* in those groups. There were three stimulus arrangements (A: 1, 2, 3; B: 2, 3, 1; C: 3, 1, 2) possible for the simultaneous groups, and three (A: 1, 1, 1; B: 2, 2, 2; C: 3, 3, 3) for the successive groups. Each of these arrangements occurred in each block of three trials. These three arrangements may be ordered in six different ways (ABC, BAC, BCA, CBA, CAB, ACB). The order in which these six combinations were administered was determined

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randomly (with the restriction that identical stimulus presentations should not occur on successive trials) to provide a total of 18 trials. The 18-trial block was repeated to produce two cycles or a total of 36 trials, the maximum number administered.

Thus, for both kinds of discrimination, each response button is correct once within each three-trial block, and no position response is ever correct two trials in a row. Furthermore, since the correct-response order is the same for both, neither group is provided mnemonic cues for possible response-sequence learning that is not provided for the other.

All *Ss* performed individually in a room away from the classroom. The same instructions were given all *Ss*, regardless of the condition of stimulus presentation to which they were assigned. When seated at the apparatus, they were informed that they would be shown some lights and that when the lights came on they were to press one of the buttons that they thought correct. In the beginning they would not know which buttons were correct, but after a while they would learn which buttons to push and then would not make so many mistakes. They were told that the green signal light would go on when they were correct, but that that light would not go on when wrong.

Ss were trained until they reached a criterion of nine consecutively correct responses or for a total of 36 trials. A trial is here defined in the conventional manner as the sequence proceeding with the onset of stimuli followed by the execution of one response, offset of the stimuli, and where appropriate onset of the reward light.

Results

The response measure here is the number of correct responses in 36 trials with correct responses assumed for those trials for any *S* beyond nine consecutively correct. Figure 1 compares the number of correct responses made over 36 trials by the simultaneous and successive groups, disregarding similarity of stimuli. While the two groups perform about equally and at chance level during the first block of six trials, the successive group overtakes the simultaneous and maintains its superiority through the remaining five blocks. Table 1 presents the over-all means and standard deviations for each of the four groups. An analysis of variance over the number-correct data, including analysis of trials effects, revealed that the superiority of successive over simultaneous training was reliable at the .01 level ($F = 7.39$, $df = 1, 36$). The main effect of stimulus similarity was not different from chance, but the trials by similarity interaction was reliable at the .05 level ($F = 4.04$, $df = 5, 180$), based on a tendency for the learning rate of the distinctive stimulus condition to be greater than that for the similar stimulus condition. Other than a trials effect significant at the .001 level, the only other reliable effect was the triple interaction ($F = 6.59$, $df = 5, 180$, $p = .001$) based on a tendency for there to be no differences in learning

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rate for the two successive groups, but a greater learning rate for the simultaneous-distinctive than the simultaneous-similar condition.

The major finding of this experiment is that under a procedure involving response to buttons removed from the stimulus source, successive stimulus presentation provided reliably better discrimination learning than simultaneous presentation.

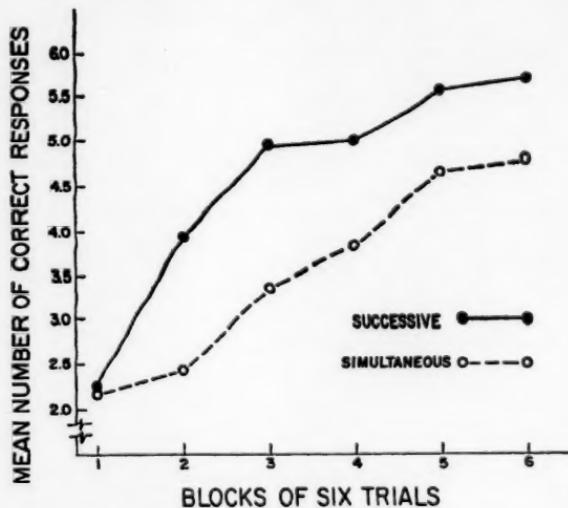


FIGURE 1—Learning curves for the simultaneous and successive groups of experiment 1, involving response to a locus removed from the stimulus source.

TABLE I
MEANS AND STANDARD DEVIATIONS FOR THE FOUR GROUPS
OF EXPERIMENT 1

	TYPE OF STIMULUS PRESENTATION					
	Simultaneous		Successive		Total	
	M	SD	M	SD		M
Similar (red, pink, blue)	21.2	7.7	27.3	6.1	24.3	
Distinctive (red, green, blue)	21.3	7.8	27.5	4.8	24.4	
Total	21.3		27.4			

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EXPERIMENT 2

This experiment was designed to determine the importance of the button-pushing response involved in experiment 1. In the present experiment, all conditions were the same as in the first experiment except that now *Ss* were required only to point toward and touch the correct window on each trial.

Method

Apparatus. The apparatus was the same as that of experiment 1. The buttons, which were removable, were taken from the response panel leaving in their place very small ($1/16$ in. diameter) holes through which the button rods leading to the microswitches passed.

Subjects and Design. The *Ss* were 20 fourth grade children from the Pleasant Street School in Seekonk, Massachusetts. These *Ss* had not been subjects in previous experiments and had never seen the apparatus with the buttons attached. All *Ss* were administered the red-pink-blue discrimination. Half of the *Ss* were administered the stimuli under the simultaneous presentation procedure, and half under the successive procedure.

Procedure. The procedure of discrimination learning was exactly the same as that of experiment 1, except that response buttons were not available to *Ss*. Instead, the *Ss* were instructed that they would be shown some lights and that each time the lights were shown they were to point toward and touch the window that they thought correct. If they touched the correct window, they would be told that that was correct, while if they touched the wrong window the *E* would indicate that this was incorrect. Manner of stimulus administration and stimulus order followed exactly the same plan as that of experiment 1. *E* said "Yes" or "Wrong" after each trial.

Results

The learning curves for the simultaneous and successive discrimination learning groups are seen in Figure 2. Here it may be seen that the simultaneous stimulus procedure is clearly superior to that of the successive group throughout training. The simultaneous group started at chance level within the first three trials of the experiment and by the third block of six trials was performing 100 per cent correctly. The successive presentation group, on the other hand, did not as a group depart from chance performance through the 36 training trials, and only one subject of 10 solved the successive problem by the end of training. A median test of the over-all difference in performance between the groups resulted in a chi square with Yates' correction of 9.8 ($df = 1$), which is reliable beyond the .01 level of significance.

It seems quite clear from experiment 2 that, when the children are required to respond directly to the stimulus source, the simultaneous stimulus presentation results in better learning, in contrast to the finding of experiment 1 where *Ss* responded to a locus some distance removed from the stimulus source.

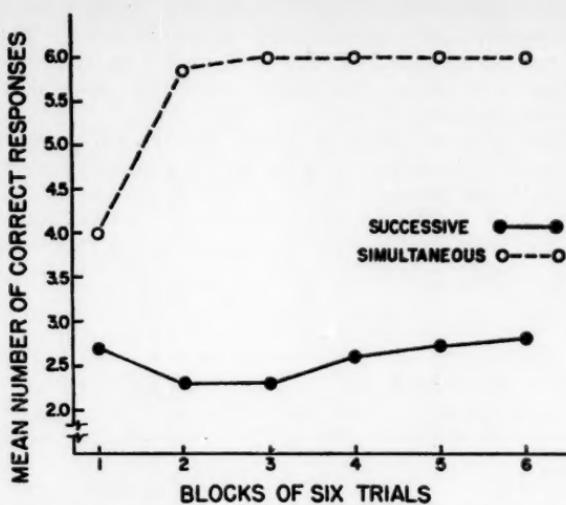


FIGURE 2—Learning curves for the simultaneous and successive groups of experiment 2, involving response directly to the stimulus source.

EXPERIMENT 3

The next experiment returns to the light-button procedure and investigates the relative ease of discrimination learning under the simultaneous and successive stimulus presentation procedures under two levels of stimulus similarity. The purpose of the present experiment was to test the limit of the successive superiority over simultaneous of experiment 1 by using a condition of extremely high stimulus similarity. It was thought that, at some high level of stimulus similarity, the simultaneous condition must produce better discrimination than the successive even under the light-button procedure, on the assumption that the psychophysical difference thresholds must be smaller for paired comparisons procedures than for methods of single stimuli. Thus, if the stimuli are made highly similar, the problem should be more soluble for simultaneous Ss than for successive Ss.

Method

Apparatus. The apparatus was the same as that of experiments 1 and 2, with the buttons replaced.

Subjects and Design. The Ss were 40 fourth grade children from the Newman Avenue and North Schools in Seekonk, Massachusetts, who had not previously participated in discrimination learning experiments. They

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were assigned randomly to one of the four conditions: simultaneous-similar, simultaneous-distinctive, successive-similar, successive-distinctive. The colors for the similar stimulus conditions were red, pink, and orange (more similar than any set in the previous two studies), and for the distinctive stimulus condition red, green, and blue.

Procedure. The conditions of learning were essentially the same as those of experiment 1, with *Ss* being instructed that on each trial they were to push the button that they thought correct after looking at the lights. Particular caution was used in insuring identical instructions for both the simultaneous and successive presentation groups. All *Ss* were trained for a total of 36 trials.

Results

Figure 3 shows the mean number of correct responses made in 36 trials by the four experimental groups, and Table 2 contains the means and standard deviations on which a factorial analysis of variance was performed. Comparison of the distinctive with the similar stimulus conditions indicates that stimulus similarity has an over-all effect on performance significant at the .001 level ($F = 18.82$, $df = 1, 36$). It may be noted that the mean performance of the distinctive-successive group is somewhat superior to that of the distinctive-simultaneous group (as in experiment 1), but for the highly similar stimuli simultaneous presentation provides clearly superior performance to successive. This interaction between type of discrimination and level of stimulus similarity fell just short of significance at the .05 level ($F = 3.92$, $df = 1, 36$), and the difference between simultaneous and successive means under the similar-stimulus condition yielded a t of 2.33 ($df = 18$, $p = .05$).

While this experiment did not reliably reproduce the successive over simultaneous superiority of experiment 1, the direction of the difference is the same, and the expected inversion of the simultaneous and successive means with a great increase in stimulus similarity is found. Thus, it appears

TABLE 2
MEANS AND STANDARD DEVIATIONS FOR THE FOUR GROUPS
OF EXPERIMENT 3

	TYPE OF STIMULUS PRESENTATION					
	Simultaneous		Successive		Total	
	M	SD	M	SD		
Similar (red, pink, orange)	22.9	7.6	15.9	4.9	19.4	
Distinctive (red, green, blue)	27.9	7.2	29.3	5.3	28.6	
Total	25.4		22.6			

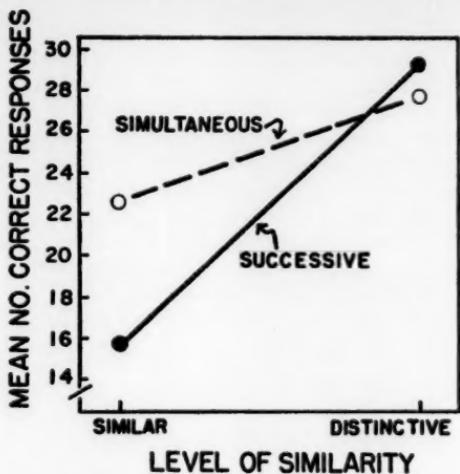


FIGURE 3—Comparisons of mean number of total correct responses from experiment 3 for the simultaneous and successive groups under two levels of stimulus similarity.

that for children both stimulus similarity and the nature of the response required are pertinent parameters in the determination of the relative ease of learning simultaneous and successive discrimination problems.

DISCUSSION

The three studies reported above considered together support the propositions that in children (a) simultaneous stimulus presentation tends to provide better visual discrimination learning than successive when the response required is to the source of stimulation, but that, (b) if the response required is to a locus removed from the stimulus source, either no differences occur or an inversion results with successive presentation yielding the better discrimination performance; furthermore, (c) this relationship is affected by degree of stimulus similarity, such that under conditions of high similarity, simultaneous presentation provides better learning than successive while with highly distinctive stimuli this difference may disappear or result in an inversion with successive superior to simultaneous. Thus, conditions which would tend to maximize simultaneous superiority over successive would involve high stimulus similarity and response to the stimulus source, with the obverse conditions tending to yield successive superiority over simultaneous.

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Several studies with infrahuman organisms (1, 2, 4, 8, 9) have found some of the above phenomena, but few studies have investigated the problem of simultaneous and successive stimulus presentation in humans and fewer still have investigated the interactions of parameters likely to lead to differential learning of the simultaneous and successive problems. Loess and Duncan (3) have shown that, under a highly similar stimulus condition or difficult discrimination, simultaneous proved better than successive learning, but when the stimuli were less difficult to discriminate there was no statistical difference between the two procedures and in fact there tended to be superiority of the successive method. Perkins, Banks, and Calvin (6) investigated the effect of delay on learning in children. Their situation involved touching and picking up the discriminative stimuli, and simultaneous presentation tended to provide better learning than successive, with no effect whatever resulting from delay (a combination of delayed reaction and delayed reward).

Recently, Murphy and Miller (5) have reported on a study with children using an experimental procedure designed to study the generality of a finding previously obtained with infrahuman primates. Their stimulus presentation procedures involved only the simultaneous method. They found that it is much easier for a child to learn a discrimination problem when he is responding directly to the stimulus source and that the problem becomes very difficult if the task is changed so that the child must now respond to a locus removed from the stimulus source, even if the child has had previous training on the same discrimination problem under the approach-to-stimulus procedure. The results of the present studies would suggest that such results would be most likely in simultaneous discrimination problems and that this phenomenon may not prevail so strikingly under a successive stimulus presentation procedure.

The present experiments suggest that the stimulus similarity continuum warrants more definitive study as it affects simultaneous and successive discrimination in children. They further suggest that other parameters (such as distance from the stimulus source of the response locus) could possibly produce similar behavioral effects and be superimposed upon the stimulus similarity dimension. It is possible also that other experimental manipulations which tend to depress discrimination learning generally, such as increasing delay of reward, decreasing age, and large spatial or temporal separation of the stimuli, might have similar effects on performance in the simultaneous and successive problems. Stimulus generalization may be the pertinent mechanism producing the inversion effects of the present studies and could result in similar findings when produced through other procedures.

SUMMARY AND CONCLUSIONS

The results of three discrimination learning studies of normal fourth grade children are reported. Comparisons of the methods of simultaneous and successive stimulus presentation are made under different levels of

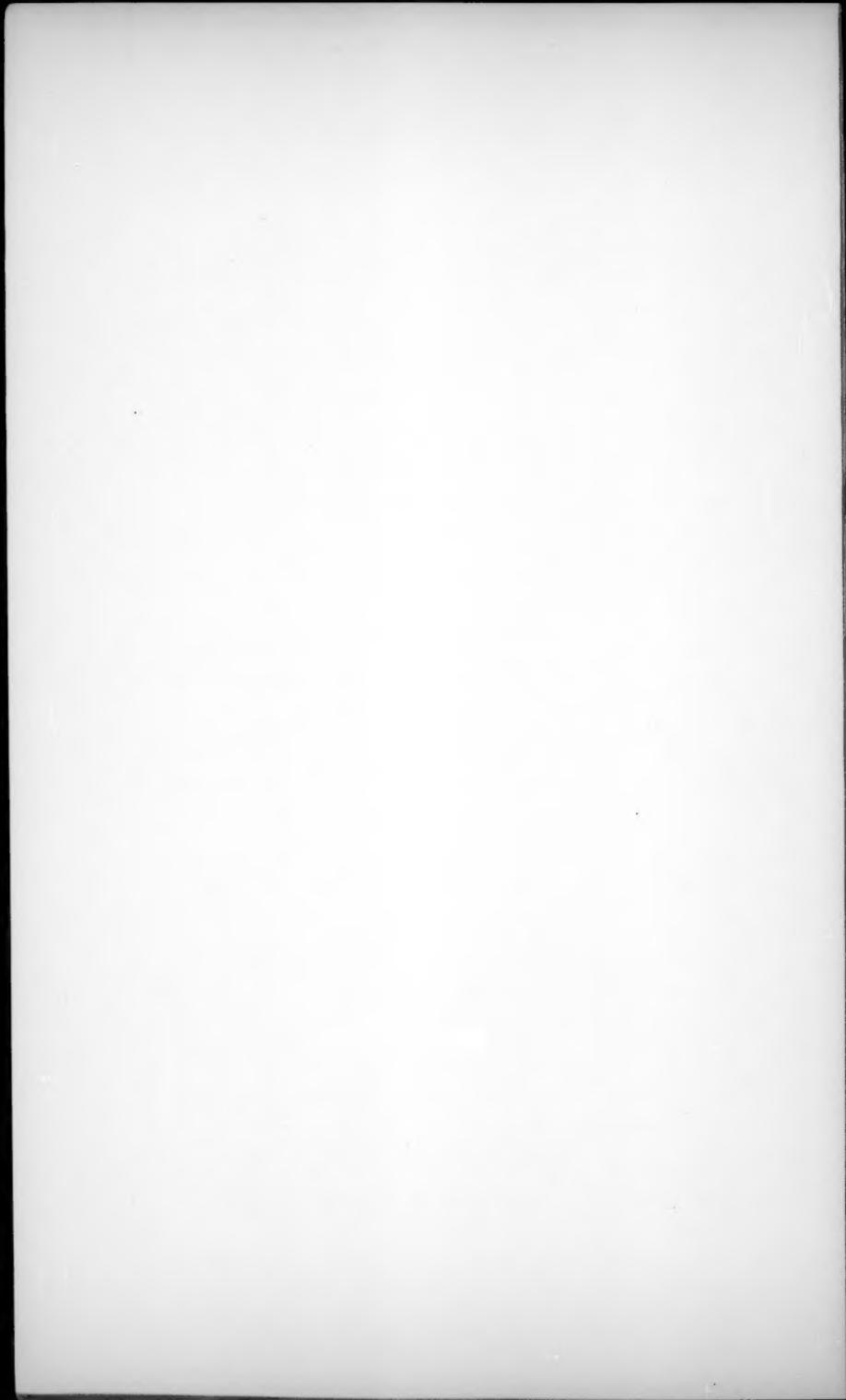
stimulus similarity and two types of response, either directly to the stimulus source or to a locus (buttons) removed from the stimulus source. The results of the three studies agree very well with the following propositions:

1. When response is directly to the stimulus source, simultaneous stimulus presentation tends to result in better learning than successive.
2. When the response is to a locus removed from the stimulus source, successive stimulus presentation may result in performance equal to or better than simultaneous.
3. The nature of the response involved in discrimination learning interacts with stimulus similarity, such that in procedures involving response to a locus removed from the stimulus source simultaneous may produce better learning than successive if the stimuli are very highly similar.

It is concluded that the relative ease of simultaneous and successive discrimination learning in children is a joint function of stimulus similarity and the type of response required. It is suggested further that other manipulable conditions undoubtedly interact with the two dealt with here and that possibly stimulus generalization is the mechanism underlying the effects of each.

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SECONDARY REINFORCEMENT IN A DISCRIMINATION PROBLEM WITH CHILDREN^{1,2}

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There have been relatively few studies of the role of secondary reinforcers in motivating the performance of children. Nor are many data available on the effectiveness of secondary reinforcers in maintaining discrimination learning. The present study was designed to contribute information on both of these points, by investigating the effectiveness of secondary reinforcers in discrimination learning in children.

Two relevant studies have been carried out with adults. Hubbard (4) trained adults with a red light as a primary reinforcer and an accompanying tone as a secondary reinforcer for correct discriminative responses. He obtained a highly significant secondary reinforcement effect; the experimental group made more correct responses during extinction trials than did either of two control groups. Fort, Myers, and Myers (3) also investigated discrimination problem performance, with a more clearly defined primary reward than that used by Hubbard. Hubbard's "primary reward" was a red light used to indicate correct responses; Fort and Meyers gave *Ss* a poker chip, exchangeable for five cents at the end of the session. The results of the two studies were highly similar.

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² The authors wish to thank Florence Leiman for her assistance in collecting the data.

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Utilizing the design of these two investigations, the present experiment attempted to determine whether the findings of Hubbard and those of Fort and Myers could be extended to grade school children. Appropriate modifications in the complexity of the task and in the primary reward were made.

METHOD

Subjects

The *Ss* were 45 fifth grade children of Cold Springs School in Belchertown, Massachusetts.³ They were assigned to three experimental groups of 15 each. An attempt was made to balance groups for age and for sex. Two children stopped before acquisition was completed (one from the *C₁* and one from the *C₂* group), and three in the *C₂* group did not reach criterion. These children were replaced by others. Once reaching criterion during acquisition, all of the children stayed for the extinction period. No special procedures were used for keeping the children in the extinction period.

Apparatus

The apparatus consisted of the *S*'s light panel box and the *E*'s control box. Mounted on the light box was a row of three identical red lights. A switch was mounted below each of the three lights. One, and only one, light was on for each trial. The order in which the lights came on was automatically determined by a stepping relay wired to produce a random series of 44 lights, with the one restriction that no light occurred more than three times in succession. When *S* pushed the switch directly below the light which was on during a particular trial, an M & M candy was dispensed to a chute, which delivered it to an opening cut in the panel box. *S*'s response also lit a corresponding light on *E*'s control box, and *E* recorded which switch was pressed by the *S* on each trial. The *E* also had easy access to switches on the control box which operated candy and buzzer mechanisms.

Procedure

Each *S* was seated in front of the light panel box, and *E* explained the rules of the game: whenever one of the lights came on, he was to press one and only one switch. If the switch pressed was the correct one for that light, a candy would be delivered. *E* then pressed one incorrect switch to demonstrate what might happen. *Ss* were also told they could leave at any time, by indicating that they wished to stop the game. *E* then took a position behind the apparatus so that minimum interaction with *S* took place during the experiment.

³ The authors wish to thank Carl J. Peterson, Superintendent of Schools in Belchertown, Massachusetts, and Mr. Donald Geer, Principal of the Cold Springs School, for their co-operation in permitting us access to the students and the school facilities.

The *Ss* were divided into three groups, a secondary reinforcement group (*S^r*) and two control groups (*C₁* and *C₂*). Training for all groups continued until *Ss* scored 10 consecutive correct responses. Children who elected to leave before this time or who did not reach criterion by the end of the third presentation of the cycle (132 trials) were replaced by another child of the same sex and similar age. Extinction began on the trial immediately following the tenth consecutively correct training response and continued for 75 trials. The *S^r* group received a buzz paired with candy during training and the buzzer alone during extinction for correct responses. Group *C₁* was also trained with a buzz and candy, but received neither the candy nor buzz during extinction. Group *C₂* received the candy alone for correct responses during training and the buzz alone for correct responses during extinction.

RESULTS

Acquisition data were analyzed to determine whether any differences existed between groups prior to extinction. The groups did not differ significantly on number of trials for reaching criterion (Kruskal-Wallis test, $H = .30$, $p < .5$). This strongly indicates that all groups entered the extinction phase without meaningful differences.

The percentage of correct responses for blocks of 15 extinction trials each are presented in Figure 1. The *S^r* group (buzz and candy in training and buzz in extinction) made many more correct responses during extinc-

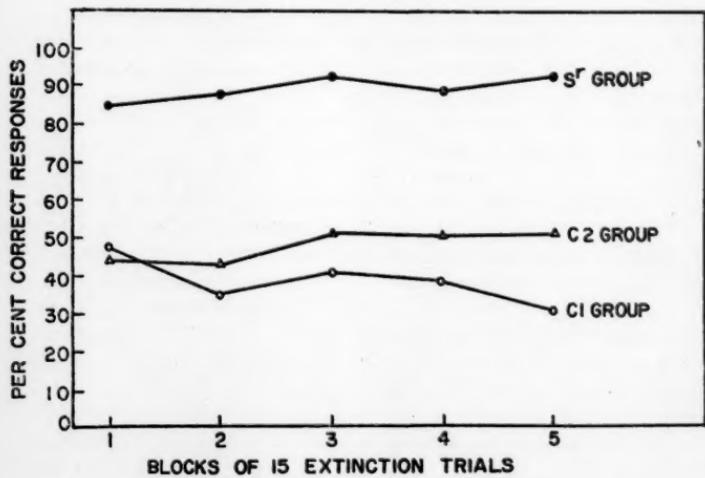


FIGURE 1—Percentage of correct responses for 15-trial blocks of extinction.

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tion than did the control groups. The mean percentage of correct responses for the S^r group was 89.4. Group C₂ (candy during training, buzz during extinction) made 48.3 per cent correct responses. Fewest correct responses (38.8 per cent) were made by group C₁ (candy and buzz during training, but neither during extinction). These Ss were apparently operating very close to a chance level (33.3 per cent).

An analysis of variance was performed on the arcsin transformations of these data and yielded a significant difference between the groups ($F = 26.38, p < .01$). Trials and the Groups-by-Trials interaction were not significant.

Duncan's Multiple Range test (2) was applied to compare each of the groups with one another. Group S^r was significantly different from each of the control groups ($p < .01$). The control groups did not differ significantly from each other.

DISCUSSION

The present study was an attempt to add to the data on the role of secondary reinforcement in human performance, by considering its effectiveness in a discrimination problem, using children as Ss. It is apparent that a strong secondary reinforcer can be established in children. The secondary reinforcer appears to be equally effective in children and adults, since the percentages of correct responses are similar for the S^r groups in three experiments, the present one, that of Hubbard (4), and that of Fort, Myers, and Myers (3). The most parsimonious explanation for this consistently high performance of secondary rewarded Ss in discrimination tasks would seem to lie in some form of a discrimination hypothesis (1, 5, 7, 8). This hypothesis assumes that secondary reinforcers increase the similarity of extinction and training trials and thus retard the S's recognition that the situation has changed. This, in turn, results in an increased resistance to extinction. This hypothesis appears particularly apt in relation to discrimination learning. In this case, the secondary reinforced Ss have a clearly discriminable stimulus (a buzz) present following correct responses and absent following incorrect responses on both training and extinction trials.

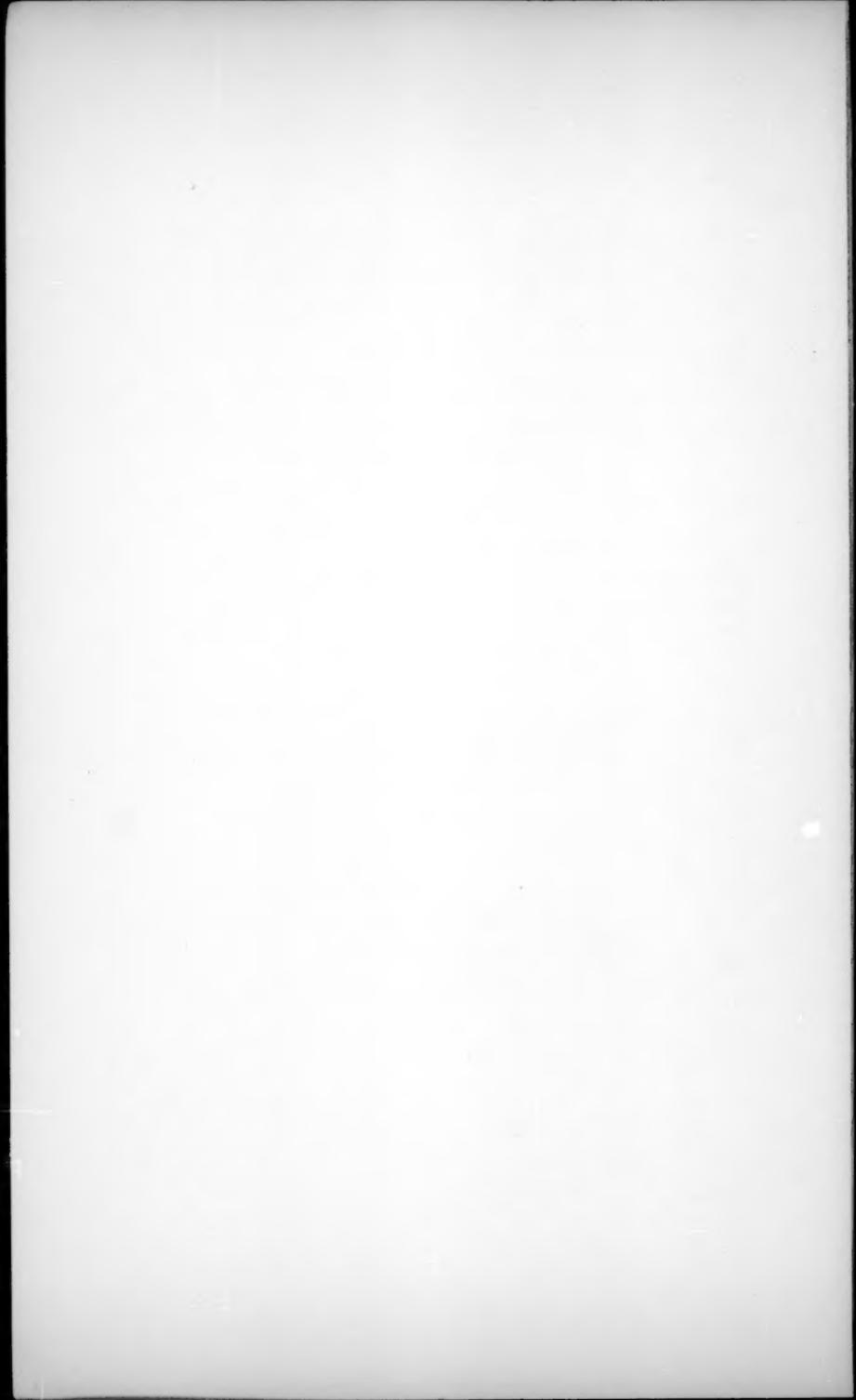
Both the Hubbard and the Fort, Myers, and Myers studies differed from the present study in one result. In the two previous investigations control group C₂ (neutral stimulus present in extinction, but not in training) performed significantly better than group C₁ (neutral stimulus in training, not in extinction). In the present study the C₂ group did not perform significantly better. In Hubbard's study the tone in extinction served the same function as the light previously had; it yielded knowledge of results. In the Fort and Meyers study, the buzzer replaced a poker chip worth five cents, and Ss may have assumed that this new stimulus was also "exchangeable" for five cents. In the present study, no such factors appear to be involved, and the resulting picture of secondary reinforcement and control group effects would therefore appear to be a more accurate one.

SUMMARY

The present study investigated the role of a secondary reinforcer in a discrimination problem for children and showed that a secondary reinforcer can be established with children, as has already been seen in studies with adults. Three experimental groups were used. The secondary reinforcement group (S^r) received candy and buzz for correct responses during training and a buzz during extinction. This group made significantly more correct responses during extinction than did either of two control groups. The first control group (C_1) received candy and a buzz for correct responses during training, but neither during extinction. The second control group (C_2) received candy during training and a buzz during extinction for correct responses. The number of correct responses during extinction for group C_2 was less than that of group S^r and slightly more than that of group C_1 .

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PERSONALITY FACTORS RELATED TO JUVENILE DELINQUENCY^{1,2}

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Research on juvenile delinquency has often been handicapped by the behavioral heterogeneity of the delinquent population. Subjects have ordinarily had one common property, the commission of some legally defined delinquent act, and nothing more. It is little wonder that knowledge about cause and consequence has accumulated so slowly; the behavioral unity required for adequate scientific investigation is lacking.

One major approach to conceptual and methodological refinement has involved the delineation of typological and dimensional constructs of various kinds. Before examining social correlates of delinquency, Reiss (17) classified subjects into three groups, those with relatively weak ego controls, those with defective superego controls, and those with relatively integrated personal controls. Similarly, Jenkins and Glickman (7) have offered a basis for classifying delinquents into an unsocialized aggressive group, a socialized delinquent group, and an emotionally disturbed group. Both these efforts, and others like them, represent a considerable advance over earlier attempts to study juvenile delinquency without further specification, but their value is limited in various ways. Most of them are stated in typological, rather than dimensional, terms, and there is some reason to doubt the very existence of nonarbitrary personality types among juvenile delinquents (18). Even more fundamentally, the earlier formulations are typically based on case history information, which is necessarily indirect, notoriously vulnerable to subjective bias, and inclined to be unreliable.

A second approach to methodological refinement has led to the construction of a number of tests which distinguish delinquents from non-

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delinquents on a behavioral rather than a legal basis (4, 9, 11, 14). Some of these instruments have proved remarkably effective in accomplishing the tasks for which they were designed (10, 12), but they fail to provide any improvement in conceptual unity. The items comprising the scales are nearly as heterogeneous in meaning as delinquents are in behavior.

Various difficulties with the above approaches can be overcome if data are restricted to behavior observations or products of some known relevance to delinquent activity and if appropriate analytic techniques are employed to define any structural concepts inherent in the data. Many kinds of behavior meet the first qualification. For this study, we have chosen questionnaire responses of demonstrated effectiveness in differentiating delinquents from nondelinquents. A number of statistical procedures have been proposed for the elaboration of structural concepts. We have elected to use centroid factor analysis.

In a previous study (13), two questionnaires which distinguished reliably between delinquents and nondelinquents were administered to 116 inmates of a boys' training school and to 115 male high school students. Responses were factorized, and five reasonably unitary, comprehensible dimensions emerged. The first implied a tendency toward impulsiveness, a lack of emotional involvement with others, and a tough, rebellious, distrustful attitude toward authority. It was called "Psychopathy." The second factor also contained an element of impulsivity, but this was associated with tension, discouragement, guilt, and depression. The factor was labelled "Neuroticism." The remaining three factors accounted for relatively small proportions of variance. One of them implied a sense of failure and incompetence and was called "Inadequacy." The other two were interpreted as background factors relating to family dissension and a history of scholastic maladjustment.

Extension of the meaning and validity of the three personality factors was sought by investigating associations with other logically related variables (15). For a sample of delinquents, Psychopathy was significantly related to recidivism, length of institutionalization, the occurrence of problem behavior and disciplinary measures during incarceration, and a history of crimes against person rather than against property. Among the variables examined, Neuroticism was correlated reliably only with a measure of manifest anxiety (1). The Inadequacy factor was related negatively to Army Beta IQ and positively to length of institutionalization. While the correlations were generally of low magnitude, they were in nearly perfect accord with factor interpretations originally developed solely on the basis of item content.

The results of this previous research appeared sufficiently promising to encourage initiation of the present study. Our purpose is the same as before: to generate a set of unitary, independent, possibly meaningful personality constructs related to delinquent behavior in the belief that these will offer a more rigorously defined frame of reference and more powerful hypotheses

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for further research than are now available to investigators of juvenile delinquency. This study differs from the previous one in that the range of behavior has been greatly expanded, and the sample of subjects approximately doubled.

SUBJECTS

Four hundred six subjects (*Ss*) participated in the investigation. Of these, 93 were in a state training school in Illinois, 93 were attending a Chicago high school, 110 were located in a state training school in Tennessee, and 110 were students at a high school in Nashville, Tennessee.

In selecting *Ss*, an effort was made to maximize variance along the gross dimension of major concern, i.e., delinquency proneness, and to reduce variance to a minimum along various other dimensions which might be related to delinquent behavior. Thus, both delinquents and nondelinquents were examined, but an attempt was made to equate the groups in respect to several other characteristics. All *Ss* were white, male, and in the same age range (10 to 18 years). Boys at the Illinois State Training School had all been residents of Chicago, and the residential area for Chicago high school students resembled that of the "average" delinquent in regard to social and cultural factors tending to foster delinquency. Comparability of the latter kind was achieved by locating the home address of each Chicago delinquent, tabulating delinquency rate (19) for the part of town in which he lived, and obtaining the mean of those rates. Choice of a high school was then determined by its location; it was situated in an area with the same delinquency rate as the mean for adjudged delinquents in the sample. The relatively small size of the population in the Tennessee training school, the diversity of background of the inmates, and the lack of information on delinquency rate for home communities prohibited similar rigor in selecting *Ss* from Tennessee. An attempt to achieve at least urban-rural comparability was maintained, however, by selecting nondelinquent *Ss* from a high school on the outskirts of Nashville which drew most of its students from the city, but some of them from outlying districts. A majority of the Tennessee delinquents (65) were from the four largest cities in the state, and the remainder (45) were from smaller communities.

PROCEDURES

Questionnaires

A battery of four questionnaires, providing nearly exhaustive coverage of available items which differentiate between delinquent and nondelinquent boys, was administered to all *Ss*.

PNI Attitude Schedule (PNI). The first questionnaire, containing 100 items, was called the PNI Attitude Schedule in reference to factors derived in previous research. Fifty-nine of the items had shown the requisite discriminatory power in earlier comparisons (4, 14) and appeared as salient

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variables marking Psychopathy, Neuroticism, and Inadequacy as defined in the factor analysis mentioned above (13). To secure better representation of the putative Inadequacy factor, 41 new items were written to express various facets of the dimension as the investigators conceived it. The Psychopathy (P), Neuroticism (N), and Inadequacy (I) items were systematically arranged in the order PINIPINI, etc., and the entire 100 items administered to the Ss.

Only 68 statements, however, were included in the analysis. Since one criterion for selection of items was their ability to distinguish delinquents from nondelinquents, it was necessary to test the discriminatory power of the 41 new items and to cross-validate the results. One hundred fourteen delinquents from the Tennessee training school were compared with an equal number of nondelinquents from Tennessee as to performance on these items. Frequencies of endorsement were tabulated, chi square tests performed, and nine items selected as discriminating "significantly" between the two groups of Ss. At this point, it became necessary to begin further analyses, and the nine items were retained in all subsequent work. On cross-validation comparison of 93 delinquents and 93 nondelinquents from Illinois, unfortunately, the nine-item subtest did not function effectively, and the 68 PNI items which were later factorized can only be described as follows: 25 of them discriminated between delinquents and nondelinquents and loaded on Psychopathy in the previous factorization; 25 differentiated between delinquents and nondelinquents and loaded on the Neuroticism factor; nine showed similar discriminatory power and loaded on Inadequacy; nine items, introduced to fortify measurement of Inadequacy, appeared at first to differentiate between delinquents and nondelinquents, but failed to do so on cross-validation.

The Personal Index (PI). The Personal Index by Loofbourow and Keys (11) was chosen as a second instrument for investigation. The test is fairly old, but we have assumed that the attitudes and other tendencies associated with delinquency have not changed radically since the discriminatory ability of the test was demonstrated, and it has been included, without modification, in the study.

The Personal Opinion Inventory (POI). A third questionnaire was assembled from certain items in the Minnesota Multiphasic Personality Inventory (MMPI), and a set of items developed in rehabilitation research in the U. S. Navy (5). The MMPI items, 33 in number, not only discriminated between previously classified delinquents and nondelinquents, but were, in addition, valid predictors of delinquent activity (6).

Items written for the Navy research were "designed to uncover individual susceptibility toward delinquent behavior in the military service" (5, p. 2). From a larger pool, 121 items were selected for their effectiveness in distinguishing Navy and Marine Corps enlisted men serving sentences in Naval retraining commands from enlisted men in various duty stations. The populations involved in this research are thus somewhat different

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from the delinquents and nondelinquents employed in the present study, but a considerable amount of research indicates that questionnaire items which differentiate between legally and socially defined groups of offenders and nonoffenders have a good deal of discriminatory generality, however the offenses are defined and regardless of subject age range. The Socialization Scale of the California Psychological Inventory, for example, has differentiated not only between delinquent and nondelinquent adolescents, but between guard house prisoners and duty soldiers in the Army, adult reformatory inmates and high school students, judged behavior problems and "good citizens" in school, and it relates rather impressively to assumed socialization over some 20 groups to which the scale has been applied (3, 4, 12). We cannot claim that the items defined by research on Navy and Marine Corps personnel actually differentiate between delinquent and nondelinquent adolescents, but there is good empirical reason to assume that the items would perform the desired discrimination, and this was our reason for including them in the battery.

The tendency among questionnaire authors to use items from previously developed instruments led to some overlap among tests. Seven of the 33 MMPI items also appeared in the PNI Attitude Schedule and were eliminated from the set now under discussion. Thirty-eight of the 119 items in the Navy questionnaire appeared either in the PNI or the MMPI, and these were also eliminated. Two more statements were omitted because they made reference to affairs of a specifically military kind. The remaining 105 items, 26 from the MMPI and 79 from the Navy scale, were entitled the Personal Opinion Inventory (POI) and were used as one test in this study.

The K D Proneness Scale (KD). The K D Proneness Scale by Kvaraceus (9, 10) was employed as a fourth questionnaire. It consists of 75 multiple-choice items which permit differentiation of delinquent and nondelinquent groups. The following item illustrates the format in which statements are presented: "Failure in school is usually due to (a) bad companions, (b) lack of ability, (c) lack of hard work, (d) unfriendly teachers." Since the response alternatives represent discrete choices, rather than points on continua, the separate alternatives were employed as elemental variables in conducting the factorization. Of the 300 variables which thus appear in the scale (75 items \times four alternatives) Kvaraceus has claimed discriminatory power for only 135, but the latter number was still too large to permit analysis, and the number of variables had to be reduced even further.

Elimination was accomplished by executing a preliminary factorization of some of the items, retaining those with the highest communalities, and pooling the latter with the remaining variables for a second analysis. The first 106 alternatives which perform the necessary differentiation were intercorrelated, and 10 centroid factors extracted. Eighty variables with communalities over .25 were then combined with the 29 remaining alternatives in the scale for the final factor analysis.

Data Analysis

The following analytic steps were performed with the aid of an electronic computer. First, phi coefficients of intercorrelation were computed for each of the four questionnaires, and 10 centroid factors were extracted from each correlation matrix. Decisions as to how many factors to rotate were largely arbitrary, although plots of variance removed by successive factors generally reinforced our decisions. Three factors were retained in the PNI Attitude Schedule, as directed by the hypothesis that Psychopathy, Neuroticism, and Inadequacy would emerge as factors in the instrument. Four factors were retained in each of the remaining three questionnaires. The four sets of factors were then rotated in accordance with Kaiser's varimax criterion (8).

The first order factors were given independent interpretation, as discussed below, and further analyses focused on relations among them. To reduce spurious intercorrelations between factors in the same test, factor scores were based on relatively pure items, viz., those with loadings $\geq .30$ on the factor in question and $<.20$ on all other factors. No differential weights were employed; scores were derived by algebraic addition, and the correlations among them determined.

As a final integrative analysis, second order questionnaire factors were defined. To permit first order factors statistical freedom to emerge at the second order, two scores had to be computed for each of the first order factors examined in the analysis. One vector in the Personal Index was eliminated because only three variables met our criteria for inclusion as salients, but two scores were obtained for each of the remaining 14 dimensions. The salient variables in each factor were rearranged in the order in which they had originally been presented to Ss. One score was then derived from the first half of the items, and another from the second half of the items. Product-moment intercorrelations were calculated for the resulting 28 variables, 10 centroid factors were extracted, and three of the latter were rotated to orthogonal simple structure as defined by the varimax procedure.

RESULTS

All questionnaires used in the investigation, all centroid and rotated factor matrices, lists of salient variables complete with loadings and item numbers, and various tables pertinent to the second order analysis have been reported elsewhere.³ Only the salient variables representing each factor will be discussed below, beginning with the first order dimensions derived

³ The four questionnaires, centroid factor matrices and rotated factor matrices pertaining to the analyses, complete lists of salient variables, and intercorrelations among first order factors have all been deposited as Document number 6606 with the ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. A copy may be secured by citing the Document number and by remitting \$5.00 for photocopies, or \$2.25 for 35 mm. microfilm. Advance payment is required. Make checks or money orders payable to: Chief, Photoduplication Service, Library of Congress.

from the questionnaires. In accordance with the usual convention, omission of sign before any item means that the response "true" is associated with the positive pole of the factor; a negative sign in parentheses at the beginning of an item indicates that the response "false" is associated with the positive pole of the factor.

First Order Factors

PNI Attitude Schedule. Salient variables for the first factor drawn from the PNI emerged as follows:

PNI Factor 1—*Psychopathy.* The only way to make big money is to steal it. It's dumb to trust older people. A lot of times it's fun to be in jail. The only way to settle anything is to lick the guy. If you don't have enough to live on, it's OK to steal. I go out of my way to meet trouble rather than try to escape it. I do what I want to, whether anybody likes it or not. I would have been more successful if people had given me a fair chance. A person is better off if he doesn't trust anyone. I'm really too tough a guy to get along with most kids. (—) I would rather be at home when things go wrong. Most brothers and sisters are more trouble than they are worth. I hardly ever get excited or thrilled.

The same amoral, rebellious qualities which characterized the Psychopathy dimension of the earlier factor study (13) are evident here and leave little doubt as to factor identity. Eleven of the 13 variables which appear in the present factor loaded over .30 in the previous one, and the two remaining items (I would have been more successful if people had given me a fair chance; I hardly ever get excited or thrilled) are perfectly consistent with interpretation as psychopathy.

Composition of the second PNI factor is remarkably like that of the Neuroticism dimension isolated before (13).

PNI Factor 2—*Neuroticism.* I don't think I'm quite as happy as others seem to be. I just don't seem to get the breaks other people do. It seems as if people are always telling me what to do, or how to do things. I often feel as though I have done something wrong or wicked. It is hard for me to act natural when I am with new people. I seem to do things that I regret more often than other people do. People often talk about me behind my back. I sometimes feel that I made the wrong choice in my occupation. (—) Most of the time I feel happy. I get nervous when I have to ask someone for a job. It seems as if I've been caught in every lie I ever told. My folks move (or used to move) from place to place a lot. (—) Most people seem to like me as soon as they meet me.

Of the 13 salient items, nine had been employed in the earlier study, and eight of these occur as markers for Neuroticism. One item previously identified with Inadequacy and four new items complete the present set of defining variables. All are sufficiently indicative of low self-esteem, dysphoric mood, tension, and guilt to justify use of the term "Neuroticism" as a label for the dimension.

The first two PNI factors strongly confirmed hypotheses regarding the structural occurrence of Psychopathy and Neuroticism, but the third PNI

factor bears no relation whatsoever to the remaining hypothetical dimension, *Inadequacy*.

PNI Factor 3—*Delinquent Background*. When I was going to school I played hooky quite often. In school I was sometimes sent to the principal for cutting up. My folks usually blame bad company for the trouble I get into. (—) I have never been in trouble with the law. When I was a little kid, I was always doing things my folks told me not to. I am behind at least a year in school. I have very strong likes and dislikes.

In fact, the items have no obvious pertinence to any aspect of personality. Most of them have some kind of historical-environmental significance, and the label, "Delinquent Background" implies little more than a history of delinquent behavior, possibly committed in company with other members of a delinquent group. From this point of view, the factor resembles Jenkins and Glickman's (7) "Socialized Delinquency," and from its apparent reference to early history it might be construed as a unification of the "Family Dissension" and "Scholastic Maladjustment" factors distinguished in earlier research with many of these same questionnaire items. An alternative interpretation is suggested by reflecting the factor. When loading signs are reversed, it is clear that covariation among the items could stem from a tendency to deny ever having done anything delinquent, or even naughty. A response set of this kind would be analogous to defensiveness as defined by the K-scale of the MMPI, and appropriately developed measures might be useful in improving the discriminatory effectiveness of other scales. Whether PNI factor 3 should be interpreted as historical background, momentary or dispositional response set, or as something else remains to be seen. At any rate, it does not represent *Inadequacy*, as we had expected, and only Psychopathy and Neuroticism have been solidly replicated as personality factors defined by this particular group of questionnaire items.

Personal Index. Loofbourrow and Keys developed their instrument in an era of psychometric preoccupation with such dimensions as neuroticism and general adjustment. A great many of the items refer to neurotic symptoms, and this concentration of content, quite different from that of the PNI, probably accounts for the emergence of two factors with some kind of neurotic quality.

PI Factor 1—*Conversion Reaction*. Do your eyes often pain you? Do you ever have the same dream over and over? Are you troubled with dreams about your play? Do you ever dream of robbers? Do you get angry so that you "see red"? Did you ever have the habit of jerking your head, neck, or shoulders? Have you often fainted away? Do you feel like jumping off when you are on a high place? Do you giggle a good deal and find you cannot help it? Do you know anybody who is trying to do you harm or hurt you? Have you the habit of biting your finger nails? Have you ever had a vision?

The first factor from the Personal Index implies a variety of conversion symptoms, along with some other hysterical tendencies, and had been correspondingly named "Conversion Reaction."

PI Factor 2—*Hypersensitivity*. Do you ever wish that you were dead? Do you feel tired a good deal of the time? (—) Do you think people like you as much as they do other people? (—) Do you usually feel well and strong? Do you ever feel that no one loves you? Are your feelings often hurt so badly that you cry? (—) Can you do good work while people are looking at you? Do you often have a hard time making up your mind about things? (—) Can you stand the sight of blood? Do people find fault with you much? (—) Do you hear easily when spoken to?

The second dimension has a noticeable depressive component, but suggests, even more strongly, an extreme vulnerability to stress and especially to social criticism. Such frailty might easily predispose depressive feelings of a reactive kind, and sensitivity itself is conceived as the core of the factor.

PI Factor 3—*Scholastic Maladjustment*. Are you required to take subjects that you dislike? Would you select another teacher in any of your subjects if you were permitted to? Have you often been punished unjustly? Were you ever expelled from school or nearly expelled? Are you ever punished for things you do not do? Do you often fail in subjects that you dislike? Did you ever want to run away from home? Do any of your teachers tell you that you are too noisy or talk too much? Do any of your teachers mark examinations too severely? Did you ever have a nickname you didn't like very well? Did you ever have a real fight? (—) Are you doing as much or as well in school as your parents expect you to? Do you think there should be more tryout or optional classes?

One of the factors drawn from the Personal Index contained only three pure items and will not be discussed. The items in the remaining factor, like those in the third factor of the PNI, have little to do with personality, but refer instead to external matters, principally to school and the unpleasantness of academic life. "Dislike for School" would not be an inappropriate name for the factor, but it is a trifle too specific, and the label we have chosen, "Scholastic Maladjustment," has a more fittingly general meaning.

Personal Opinion Inventory. The PNI Attitude Schedule yielded one "Neuroticism" factor. The Personal Index of Loofbourouw and Keys yielded two factors related to more narrowly limited aspects of neuroticism, viz., conversion tendencies and hypersensitivity. Now the Personal Opinion Inventory, made up of items from the MMPI and from research on Naval offenders, has produced still another factor whose content can be subsumed under the general concept of neuroticism, but whose focus is more specifically upon neurotic tension and the social isolation frequently related to such dynamics.

POI Factor 1—*Neurotic Estrangement*. At times I have a strong urge to do something harmful or shocking. No one seems to understand me. It is hard for me to just sit still and relax. Sometimes my conscience makes me do things that get me in trouble. My parents never really understood me. I feel that I have often been punished without cause. One or more members of my family is very nervous. I am so touchy on some subjects that I can't talk about them. My way of doing things is apt to be misunderstood by others. I must admit I find it very hard to work under strict rules and regulations. I have the wanderlust and am never happy unless I am roaming or traveling

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about. If I am not feeling well I am somewhat cross and grouchy. It makes me uneasy when someone does me a favor I didn't expect. I would rather go without something than ask for a favor. I feel like jumping off when I am on a high place.

Many of the items have something to do with tension or its derivatives. Most of the remaining variables refer in one way or another to misunderstanding and difficulty in open communication with other people. "Neurotic Estrangement" fails to place any particular emphasis on tension, but it summarizes the social distance implied by the variables, and suggests a neurotic basis for this state of affairs.

POI Factor 2—*Egocentricity*. A guy who doesn't look out for himself first is a sucker. We ought to worry about our own country and let the rest of the world take care of itself. It's no use worrying my head about public affairs; I can't do anything about them anyhow. I don't blame anyone for trying to grab all he can get in this world. A person does not need to worry about other people if only he looks out for himself. Any job is all right with me, so long as it pays well. Only a fool would ever vote to increase his own taxes. There are only two kinds of women—the good and the bad. Sometimes I think I'm too nice to some people. When I am cornered I tell that portion of the truth which is not likely to hurt me. I would like to hunt lions in Africa.

The only "psychopathic" factor discussed so far, factor 1 of the PNI Attitude Schedule, contained a variety of elements which permitted unification under the general concept of psychopathy. Disregard for and distrust of authority, positive enjoyment of antisocial activity, rejection of conventional norms, isolation from close family ties, and blunting of strong positive affect were all represented. The second factor from the POI, on the other hand, most strongly emphasizes a single quality, egocentricity, but the self-centeredness is so blunt in its expression that it could hardly occur except in company with other psychopathic tendencies.

POI Factor 3—*Social Desirability*. I would never play cards (poker) with a stranger. If I get too much change in a store, I always give it back. I am embarrassed by dirty stories. It would embarrass me to have a girl tell me a dirty story. Women should not be allowed to drink in cocktail bars. (—) During one period when I was a youngster I engaged in petty thievery. I have lived the right kind of life. (—) I would like to wear expensive clothes. The average policeman is not strict enough about the law. We ought to pay our elected officials better than we do.

The items in the third factor extracted from the POI suggest a prim morality that is too "good" to be genuine. In interpreting the third factor from the PNI Attitude Schedule, tentatively labelled "Delinquent Background," an alternative interpretation was proposed, namely that a reflection of the factor might represent defensive refusal to admit the commission of any socially unacceptable acts. A similar interpretation seems tenable for the present factor, and it has been named "Social Desirability" in the belief that a response set, and nothing deeper, has occasioned coalescence of the variables.

POI Factor 4—*Concern over Others' Opinions*. I really care whether people like me or dislike me. When people dislike me, I figure it's worth while to try to change their opinion. I often think about how I look and what impression I am making on others. I never refuse to play a game because I am not good at it. I find it hard to "drop" or "break with" a friend. It is very important to me to have enough friends and social life. It makes me angry when I hear of someone who has been wrongly prevented from voting. Before I do something, I try to consider how my friends will react to it. There is something wrong with a person who can't take orders without getting angry or resentful. It is easy for me to sympathize with someone who is always doubting and unsure about things. I regard the right to speak my mind as very important.

Some time ago, Gough (2) proposed a role-taking theory of psychopathy whose central postulate was that psychopaths are unable to see themselves from the point of view of other people. The idea led to development of a questionnaire scale for measuring role-taking capacity, and performance on the scale was related rather convincingly to role-taking ability in an experiment by Reed and Cuadra (16). The fourth factor derived from the POI appears at first to be a fairly pure representation of role-taking concern, if not ability, and it is interesting to note that the factor correlates to a modest but reliable degree (−.23) with the Psychopathy factor of the PNI Attitude Schedule. The cogency of this interpretation is weakened, however, by the fact that the average factor score for delinquents is higher than for non-delinquents and by the collective impression one gets from reading the variables that they constitute an exaggerated overstatement of concern for social approval. Again, some kind of defensive response set may be involved, but this, like the role-taking hypothesis, is difficult to assess from mere inspection of the items. At least, the statements have clear pertinence to concern over the evaluation of others, and we have chosen a properly conservative label to express this fact.

K D Proneness Scale. The relative complexity of item format in the K D Proneness Scale makes factor interpretation more difficult than for the simpler, forced-choice questionnaires discussed so far. In attempting to discern the meaning of each response tendency, one must not only consider the alternative which has been chosen or denied, but must also note relations with the other available alternatives. Thus, the first item in KD factor 1, presented below, suggests endorsement of the following kind of idea: "Whatever else policemen may do—scare you, boss you, or get something on you—they do *not* try to help you." This item, like all the KD items, is presented with the crucial alternative italicized, and the three remaining alternatives in parentheses. Signs before each item indicate whether a given italicized alternative was chosen (sign omitted) or rejected (−).

KD Factor 1—*Situational Delinquency*. (−) Most policemen try to *help you* (scare you, boss you, get something on you). (−) A boy or girl should be allowed to be his own boss when he is *21 years old* (14 years old, 16 years old, 18 years old). (−) The police are *usually very fair* (make some mistakes, favor the rich, are usually unfair). Most boys stay in school

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because they *are required by law to do so* (have to learn to make a living, want to go to college, like school). When not in school, I can have the most fun *around midnight* (in the mornings, in the afternoons, around noon). On my report card I usually get *some failure marks* (all honor marks, mostly good marks, fair marks). I have the most fun when I play *on my street* (in my own house, in my own yard, on the playground near my house). If a person called me a dirty name, I would *fight the person* (tell him where to get off, say and do nothing, laugh it off). When I leave school or graduate, I shall *take it easy for a while* (take any job that comes along, find a good job, go to another school or college). Going to high school is *all right for some people but not for me* (a waste of time, all right if you can take the course you want to, necessary for success). (—) If a person called me a dirty name, I would *say and do nothing* (fight the person, tell him where to get off, laugh it off). Going to school right now is doing me *more harm than good* (a great deal of good, some good, a great deal of harm). I have been *unlucky* (extremely lucky, lucky, extremely unlucky). (—) Most boys stay in school because they *want to go to college* (are required by law to do so, have to learn to make a living, like school). When I am with someone else and we want something to drink, I like to *match to see who will pay* (buy my own drink, fix it so the other person usually pays, pay for all the drinks). (—) On my report card I usually get *mostly good marks* (all honor marks, fair marks, some failure marks). Of the following sports, the one I like best to watch is a *prize fight* (baseball game, horserace, basketball game).

Few of the items in the first KD factor have clear relevance to personality as a set of internal dispositions. Most of the referents are outside the individual (policemen, school situations, social regulations, and the like). Insofar as personal characteristics are represented, they apparently constitute desires for early independence, rejection of middle-class beliefs in the value of education and hard work, and wishes just to have a good time without the annoyance of rules or constraints. Factor meaning is anything but obvious, and another psychopathic expression may be involved. The attitudes implied, however, are those commonly said to arise merely from long exposure to a delinquent subculture, with no truly psychopathic basis, and we tentatively propose the name "Situational Delinquency" as a label for the dimension.

KD Factor 2—*Irresponsibility*. In school, my friends *always get me into trouble* (almost always get me into trouble, sometimes get me into trouble, never get me into trouble). I think about what I'll do when I get out of school *not at all* (all the time, most of the time, some of the time). Going to school right now is doing me *a great deal of harm* (a great deal of good, some good, more harm than good). Whenever I get into serious trouble, other people are to blame *always* (almost always, sometimes, seldom or never). Taking part in school clubs is *very unimportant* (very important, quite important, not very important). The best teachers are the ones who are *very easy* (fairly easy, fairly hard, very hard). When I leave school or graduate, I shall *take any job that comes along* (find a good job, take it easy for awhile, go to another school or college). (—) When I leave school or graduate, I shall *find a good job* (take any job that comes along, take it easy for awhile, go to another school or college). Being successful usually means having *your name in the paper* (a big fortune, many friends, the

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respect of many people). (—) In school, my friends *sometimes get me into trouble* (always get me into trouble, almost always get me into trouble, never get me into trouble). Those who get the best jobs are usually the ones who *are the luckiest* (know the right person, are the best trained, work the hardest).

The tendencies expressed in the second KD factor include denial of personal responsibility for getting into difficulty, a lack of concern over academic and vocational success, a belief that success is tantamount to notoriety, and that it is obtained through luck, rather than effort, training, or even "pull." "Irresponsibility" summarizes these attitudes rather well, and a more central psychopathic tendency may again be represented.

KD Factor 3—Response Set—Central Tendency. (—) During the past month I have worried about my family *all the time* (most of the time, some of the time, not at all). During the past month I have worried about my family *some of the time* (all of the time, most of the time, not at all). (—) I think about what I'll do when I get out of school *all the time* (most of the time, some of the time, not at all). I think about what I'll do when I get out of school *some of the time* (all the time, most of the time, not at all). The pupils who have the best attendance records are almost always *good students* (honor students, poor students, sissies). Failure is usually due to *lack of hard work* (bad habits, bad companions, lack of ability). (—) Going to school causes me to be worried and upset *most of the time* (all the time, some of the time, not at all). I usually have the best time when I do things *with two or three friends* (all by myself, with one friend, with a big gang). (—) The secret of success is *ability* (just luck, hard work, money).

It seems unlikely that the variables in KD factor 3 were drawn together by any enduring personal trait. What seems to be involved is consistency in avoiding extreme statements and in selecting moderate, "middle-of-the-scale" alternatives. This is nothing more than a response set, and the title of the factor has been phrased accordingly.

KD Factor 4—Attitude toward School. Most teachers are *fair most of the time* (very fair, seldom fair, never fair). (—) The most popular boys are the ones who *almost never get into mischief* (almost always get into mischief, sometimes get into mischief, seldom get into mischief). Going to college is *all right if you can afford it* (necessary for success, all right if you have the ability, just a waste of time and money). Going to high school is *all right if you can take the course you want* (a waste of time, all right for some people but not for me, necessary for success). (—) The best teachers are the ones who are *very hard* (very easy, fairly easy, fairly hard). Cheating in school is usually done by *most of the pupils* (only a few bad pupils, none of the pupils, all of the pupils). Cheating in school is usually done by *none of the pupils* (only a few bad pupils, most of the pupils, all of the pupils).

Six of the seven items in KD factor 4 have something to do with school, but the nature of the attitude represented is difficult to stipulate. Some of the variables seem related to a vague lack of enthusiasm for educational matters, but attitudinal implications are not sufficiently specific to warrant interpretation beyond the obvious reference to academic affairs.

Intercorrelations among Factors

The complete table of correlations among first order factors can be obtained, along with other tabular materials, from the American Documentation Institute.⁴ This discussion will principally concern relations between first order factors which were similarly interpreted.

Some concept implying neuroticism was invoked more often than any other in labelling dimensions. Four factors, Neuroticism from the PNI, Conversion Reaction and Hypersensitivity from the PI, and Neurotic Estrangement from the POI, were alleged to represent neurotic tendencies of one sort or another, and if these propositions are sound the factors ought to be related among themselves. In fact, the mean r for pertinent intercorrelations is .49, which is about as high as one could expect, considering the limited number of items on which factor scores were based.

Except in the case of PNI factor 1, specification of "psychopathic" factors was less clear than for "neurotic" ones. However, intercorrelations for some of the traits generally associated with the concept of psychopathy, e.g., Psychopathy itself from the PNI, Egocentricity from the POI, and Irresponsibility from the KD, are worth considering. The mean intercorrelation for those dimensions is .29. This value is lower than for "neurotic" factors, principally because our measures of Egocentricity (POI-2) and Irresponsibility (KD-2) were not closely related ($r = .17$). The correlation between Psychopathy (PNI-1) and Egocentricity (POI-2) was .34, and the r for Psychopathy and Irresponsibility (KD-2) was .35. With an N of 406, all three rs are significant beyond the .01 level, but none of them is particularly impressive.

Evaluation of the complete matrix of factor intercorrelations also requires consideration of relations among various factors within each test. These should of course be lower than for allegedly similar factors in different tests. The mean r for intratest correlations was .21, which is satisfactorily less than the mean for factors implying neuroticism, but not compellingly different from the mean r of putative "Psychopathy" factors.

The remaining dimensions were sufficiently diverse in meaning to prohibit supraordinate evaluation without additional analysis. To assess relations among them, as well as to test hypotheses regarding the coalescence of "Neuroticism" and "Psychopathy" factors, a second order factorization was conducted.

Second Order Factors

Results are given in Table 1. The salient variables are halves of the first order dimension, presented by indicating second order loadings and first order factor designations, with the letters "a" or "b" to show which half of each primary factor is involved.

Factor I is dominated by elements suggesting neuroticism. Every one of the first order constituents thought to refer to a neurotic tendency has

⁴ See footnote 3.

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TABLE I
SECOND ORDER FACTORS

Loading	Factor I—NEUROTIC DELINQUENCY		Factor II—DELINQUENT BACKGROUND (or DEFINIVENESS)		Factor III—PSYCHOPATHIC DELINQUENCY	
	First Order Designation	Loading	First Order Designation	Loading	First Order Designation	Loading
67	PNI-2a	Neuroticism	66	KD-1a	Situational Delinquency	56
67	POI-1b	Neurotic Estrangement	—66	POI-3a	Social Desirability	56
65	POI-1a	Neurotic Estrangement	63	KD-1b	Situational Delinquency	54
65	PI-2a	Hypersensitivity	50	PI-3a	Scholastic Maladjustment	52
65	PI-1a	Conversion Reaction	46	PNI-3b	Delinquent Background	51
64	PNI-2b	Neuroticism	—45	POI-4a	Concern, Others' Opinions	49
62	PI-2b	Hypersensitivity	44	PNI-3a	Delinquent Background	47
60	PI-1b	Conversion Reaction	43	PI-3b	Scholastic Maladjustment	POI-2a
50	PI-3a	Scholastic Maladjustment	—40	POI-4b	Concern, Others' Opinions	Egocentricity
48	PI-3b	Scholastic Maladjustment				
47	PNI-3b	Delinquent Background				
44	PNI-3a	Delinquent Background				

a loading of .60 or more. Below that point, discontinuity appears in the distribution of loadings, and then a second cluster of first order elements can be seen. The latter refer to a history of delinquent activity and difficulty in school and characterize the present neuroticism factor as an alloplastic one. The neurotic tendencies, which would otherwise be indistinguishable from those among the clientele of a typical guidance clinic, are evidently expressed outwardly in this behavioral pattern; they are "acted out" against society.

Factor II is more difficult to interpret than the first one. The pattern of positive and negative loadings suggests that covariation could be determined by a consistent tendency to endorse statements implying a history of misbehavior and to deny items implying concern over society's evaluation of the behavior. The underlying attitudes are those commonly thought to occur among members of delinquent gangs, and this, in the absence of any clear expression of personality disturbance, suggested "Delinquent Background" as a label. Another interpretative possibility, however, becomes apparent when the factor is reflected, namely, that the factor could express a tendency to place oneself in a socially favorable light and deny past commission of delinquent acts. It is difficult to say which interpretation is more likely just by looking at the items, and further study is obviously needed.

Factor III unifies those first order dimensions assumed to reflect psychopathic tendencies and has been labelled accordingly. In general, the primary factors thought to refer to various facets of psychopathy appear as salient variables at the second order. In addition, half of KD factor 4, vaguely defined as "Attitude toward School," appears with a fairly high loading, suggesting that the attitude involved may represent another facet of the psychopathic viewpoint.

Together, the three second order factors define a structure remarkably similar to that developed by Jenkins and Glickman (7) from case history data. The conceptual parallels between "Neurotic Delinquency" and "Disordered Delinquency," "Delinquent Background" and "Socialized Delinquency," and "Psychopathic Delinquency" and "Unsocialized Aggression" are obvious, but operationally defined associations remain to be established.

In time, further research on these dimensions should proceed to extensive elaboration of antecedent and consequent relationships, but it should probably begin with the establishment of concurrent validity and more thorough examination of such purely psychometric properties of the measures as reliability and independence. Some preliminary checks with military personnel suggest that scales based on the second order factorization are not nearly as independent as one might expect from the nature of their derivation. This is true even when the cooperative elements of factors I and II are excluded, and further purification will probably be necessary.

In the present study, a premature effort was made to relate the first order questionnaire factors to three factors derived from teacher ratings and to a limited number of indicants taken from institutional files. The

results were almost wholly incomprehensible, and, while this may mean that the questionnaire factors are unrelated to anything outside themselves, we are more inclined to question the adequacy of the ratings and of our own first order factor measures. In some cases, the latter were based on as few as seven items and were never derived from more than 17. Results with previous measures of Psychopathy, Neuroticism, and Inadequacy appeared rather promising (15). It seems reasonable to suppose that the present more comprehensively defined measures may also be related to crucial extratest variables and that their application may eventually lead to a substantial increase in knowledge about personality factors and the part they play in juvenile delinquency.

SUMMARY

Four questionnaires which differentiate delinquents from nondelinquents were administered to 203 training school inmates and to 203 high school boys. The items in each questionnaire were intercorrelated over the entire sample, and four separate factor analyses conducted. The resulting first order factors were individually interpreted, relations between them were examined, and a second order factorization was performed. The following results emerged.

1. Psychopathy and Neuroticism factors isolated in previous research were almost identically reproduced in the present first order analysis.
2. A factor called "Inadequacy" in the previous study did not appear in this investigation.
3. Differences in item content from questionnaire to questionnaire occasioned differences in meaning of first order factors, but many of the latter could be subsumed under second order concepts of Psychopathic and Neurotic Delinquency.
4. Most of the remaining first and second order dimensions seemed to refer to a history of delinquent behavior, and possibly to previous membership in a delinquent group, but interpretation as test-taking defensiveness was also frequently considered.

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PERCEPTION OF THE PARENT-CHILD RELATIONSHIP AND ITS RELATION TO CHILD ADJUSTMENT

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One of the basic tenets of developmental psychology is the thesis that the early familial environment of the child, especially the pervading parental attitude or emotional tone of the parent-child relationship, is a fundamental factor influencing the development of personality. Clinical data offer strong support to the theory of a correlation between parent-child relationships and the nature of children's personality or relative adjustment (7, 8, 9, 14). Much research has been effected for the purpose of isolating the particular attitudes which affect the child (3, 5, 6, 15) and the qualities of personality that are the result of the specific attitudes determined (10). Often, however, this research has been inadequate or contradictory, leaving a confused picture of the relationships involved.

A review of the research offers a few explanations for the meagerness of results on this problem: Ausubel's study (1) suggests that the essential relation is that which exists between the child's perception of his familial environment and his adjustment and not, as has been thought, between expressed parental attitudes and childhood adjustment. Based on evidence in Swanson's study of delinquents (13), it was thought that, rather than use attitudes as good indicators of the nature of the parent-child relationship, it might be more useful to measure the proximity of a given child's relationship to the theoretical ideal relationship. These two possibilities suggested a third: if it is the child's perception of his familial relationships which affects his adjustment, then parental perception of the parent-child relationship may well disagree with the child's perception of the same, and, if so, the former is unlikely to be related to the child's adjustment. On the basis of these suggestions, the following hypotheses were constructed:

1. A child's perception of his parent-child relationship is correlated to his adjustment: the well adjusted child will perceive his parent-child relationship as relatively happy and close to the theoretical ideal, whereas the maladjusted child's perception of his relationship will be far from ideal.

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2. There is little agreement between parental perception of the parent-child relationship and the child's perception of the same.
3. Parental perception of the parent-child relationship, therefore, does not correlate with the offspring's adjustment.

METHOD

Subjects

The sample of children consisted of 102 boys and girls, 9 and 10 years of age, who attended the fourth grade in public schools. The schools used were chosen because of the variability in the socioeconomic level of the parents and because of a reputed range of student adjustment. Fourth graders were used because they are young enough not to be involved in adolescent dynamics and old enough to comprehend the tests, and, also, it was thought that they might be more willing to respond truthfully than older children, more aware of social meanings, would be. The mean number of siblings was three.

The parents were those of the selected children, excluding those of children who obtained the mean adjustment score. Seventy sets (both mothers and fathers) were contacted. Most of the parents were of upper-lower and lower-middle class, with about one-sixth of lower-lower and one-sixth of middle- or upper-middle class.

Instruments

The California Test of Personality (CTP), Elementary Series AA, was used to measure the children's adjustment. A high score on the CTP indicates relatively good adjustment.

The Swanson Child-Parent Relationship Scale (CPRS) (13) was used to measure perception of the parent-child relationship. Swanson, using the scale on adolescents, found that it did not discriminate well at the ideal end of the test, but that it was a good discriminator at the other end of the scale (13). Since other relationship measures have proven to be so inadequate, the CPRS seemed to be the most usable measure in spite of this difficulty. The language and concepts of the scale were sufficiently elementary to be comprehended by fourth graders, and the form of the items was such that they could be reworded to provide a parallel measure for the parents' perception and, thus, afford a means of comparison. Consequently, the parents' scale contained the same questions, but they were reworded so that each item asked the parent for his perception of the relationship. A high score on the CPRS indicates a poor parent-child relationship as perceived by the subject.

In addition to the two tests, a short information questionnaire was used for each student. It included such items as name and address, whether or not the child lived at home with both real parents, father's occupation, and number of children in the family.

Procedure

The teachers of the three chosen classes distributed letters asking for parents' permission to use their children. The children were given no information previous to the testing time. The day the tests were administered, the children were told that the purpose of the tests was to gather information about fourth graders as a whole and that the tester was not interested in individual people. No names were requested, and the fact that names would remain anonymous was emphasized. Each test was coded so that the two tests and questionnaire of a given subject could be identified. The children were also told that their true feelings were being sought and that there were no right or wrong answers: they were to answer as they really felt. These facts were reiterated, and it was suggested that they ask questions when they had difficulty recognizing words. It was found that those children who could not recognize words could, however, understand them when they were pronounced for them. The CTP was administered first, according to the standardized instructions in the manual. Each child was allowed to finish the test at his own rate of speed. The CPRS was given next, again with no names requested and with reminders about answering according to true feelings with no fear of being identified. Thirdly, after all the tests were collected, the children filled out the information questionnaire.

The parents were sent letters explaining, nebulously, the nature of the study, requesting their participation, and giving instructions for taking the tests. Two copies of the parental form of the CPRS were included. Mothers and fathers were asked to participate individually. Names were not requested, and, again, the tests were coded so that they could be matched with children's tests. Two weeks after the letters and tests were mailed, a letter of reminder was sent out, requesting that those who had not done so return their questionnaires. Thirty-one sets of parents and five additional mothers replied adequately. Fifty-one per cent of the mothers, therefore, and 44 per cent of the fathers participated. The percentage of returns, compared to other studies (11, 12), was quite high, as much of the past research has been based on less than 20 per cent returns. The mean adjustment score of the children whose parents participated in the study was the same as the total child sample. The returns, therefore, were considered adequate.

The final parent sample consisted of 31 fathers and 36 mothers. Ten of the original children were absent the day the tests were given, one did not receive permission to participate, and three were omitted because they did not live at home with both real parents; thus, the total child sample consisted of 88 children, 44 boys and 44 girls.

RESULTS

The Pearson product-moment correlation coefficient between the children's CPRS and their scores on the personal Adjustment part of the CTP was $-.77$; the Social Adjustment scale of the CTP, minus the Family Relation-

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ship component (one group of items on the scale which is similar to the CPRS), correlated $-.84$ with the CPRS; the correlation of the CPRS with the Total Adjustment score, minus the Family Relationship component, was $-.80$. All three correlations are significant beyond the 1 per cent level of confidence.¹ A negative correlation means that a low score on the CTP (poor adjustment) correlates with a high score on the CPRS (perception of the parent-child relationship as far from ideal). Thus, there is significant support for the first hypothesis: the well-adjusted child perceives his parent-child relationship as relatively happy and close to the theoretical ideal, and the maladjusted child's perception of his parent-child relationship is far from ideal.

The correlation between mothers' and offsprings' CPRS scores was $.17$; between the fathers' and offsprings' scores, it was $.19$. Both correlations are insignificant and, therefore, support the second hypothesis: there is very little agreement between parental perception of the parent-child relationship and the child's perception of the same.

A correlation of $.04$ was found between mothers' CPRS scores and their children's scores on Total Adjustment, minus the Family Relationship component of the CTP. The correlation between the fathers' CPRS scores and the children's adjustment was $.16$. Both correlations are insignificant and support the third hypothesis: the parents' perception of the parent-child relationship is not related to their children's adjustment.²

DISCUSSION

In an attempt to discover the limitations of the results, a chi square was determined between socioeconomic status of the family (measured by occupation) and the children's adjustment. There was no significant relation. The means for the CTP and the CPRS were the same for children in large families as they were for those in small families. Socioeconomic status and the number of children in the families were excluded as factors that could have affected the correlations. There seemed to be no other common contaminating factor which could have influenced the test results. Because of the young age of the children and the manner in which the tests were administered, it is fair to assume that the children responded truthfully. It is highly improbable that a child of 9 or 10 years of age could so alter his responses as to make his scores on both tests correlate, and it is even more improbable that a large enough part of the sample could have seen through the tests. It also seems justifiable to assume that the parents were

¹ All correlations in this paper were calculated on two-tailed tests.

² The product-moment correlation coefficient for an agreement score between mothers and fathers and their children's CTP scores was $.21$, which is not significant. For the same sexed parent and the CTP, the coefficient was $-.47$; for the opposite sexed parent and CTP, it was $.20$. It must be remembered that two-thirds of the parents who responded were parents of boys and that boys had lower adjustment scores than did girls.

honest, for had they not been sincere they need not have participated. Also, they often added comments to the test questions, indicating thoughtfulness and concern. Based on information given by the teachers, it is obvious that ability to answer discriminatively did not correlate with IQs.

The only indicated limitation to the test results is the skewed discriminating character of the CPRS. It differentiated more adequately on this sample of children than it did on Swanson's sample, although it still was a better discriminator at the upper end of the scale. As the test was a reliable indicator of a poor parent-child relationship, it seemed that, instead of negating the validity of the correlations, the broad rather than precise differentiating characteristic of the scale merely decreased the size of the correlation. In defense of this conclusion, it is noted that, when the correlations were determined for each class separately, the greatest correlation came from the class with the most maladjusted children (independently determined).

The major implications of the results focus on the child's perception of his home life. It seems that an important developmental step has been underemphasized in theory and almost absent from research. Previous experiments have tried to relate parental attitudes or the quality of the parent-child relationship (measured by questionnaires or interviews) directly to the nature of child adjustment. They have not discovered definite one-to-one relations, for they have failed to take into account the fact that the child reacts to his perception of the situation and not directly to the situation itself. The results of this study imply that, when this fact is recognized, the expected correlations appear.

The parent-child relationship of a family, which includes parental attitudes toward childrearing, involves many subtleties which have individual, often subconscious, meanings for all concerned. These meanings influence each individual's perception of the relationship. The child's perception of the relationship is of extreme importance to him, for it is directly related to his adjustment; the actual parent-child relationship is only indirectly related to a child's adjustment. Studies of the dynamics of child psychology must, therefore, discover the course of development of children's perception of their familial environment and the factors that allow parental perception of the same environment to be so very different. Only then will it be feasible to discover more exactly the relation between child adjustment and parental attitudes.

SUMMARY

A review of the research performed within the area of parent-child relationships and child adjustment led to the formulation of three hypotheses: (a) a child's adjustment is related to his perception of his relationship with his family; (b) the child's perception of the relationship is unrelated to his parents' perception of the same; and (c) the parents' perception of the relationship is unrelated to his offspring's adjustment. The method used

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to test these hypotheses was described. The statistical results obtained significantly support the hypotheses.

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ANXIETY AND VERBAL BEHAVIOR IN CHILDREN¹

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The main purpose of this study was to determine whether certain of the previous findings obtained on the Yale Test Anxiety Project could be extended to different kinds of situations. Up to the present our investigations of the effects of test anxiety (6) have been carried out in situations where the *Ss* were asked to perform on a problem-solving task. Although some of the tasks were relatively unstructured, the exact nature of the desired response left unspecified, the *S* could not have helped viewing the tasks as "testing" something. Thus, for certain *Ss* the experience was bound to cue off certain responses of anxiety.

It was decided, therefore, to study the effects of test anxiety on the verbalizations made by *Ss* during a face-to-face interview situation in which the *S* was asked to talk about how he felt about various things ranging in generality from the things he did last summer to something that happened to him that made him very worried. To attempt to manipulate the hypothesized arousal of fears of inadequacy which are signaled as being near conscious awareness by feelings of anxiety, two interview conditions were used. It was felt that the differences predicted would be increased by indicating to the *S* (in one condition) that he would be given a test after the interview. Thus, the arousal of anxiety would occur before the interview started and would be enhanced by whatever aspects of the situation that already suggested to the *S* that he was in a test situation. Further, it was hoped (with somewhat less conviction) that it would be possible to reduce the apprehension of the *S* about the interview being a test situation by simply telling him (in a second condition) that the interviewer and he were just going to talk and that this was in no way a test.

One of the major sources of the interfering effects of anxiety on the performance of certain tasks is the compelling nature of the feeling of anxiety itself so that the individual who is experiencing anxiety is less able to attend to the external stimuli relevant to the task. He is, so to speak, forced to attend to the uncomfortable feelings of anxiety. We hypothesized that among high anxious (HA) individuals one would find a greater

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number of references to negative feelings given in verbal productions under evaluative conditions than one would find among low anxious (LA) *Ss* under the same conditions. Further, this difference in verbal productions would not be found between the two anxiety groups under the permissive conditions. The above, of course, reflects the HA *S*'s concern over his uncomfortable feelings of anxiety. In addition to the differences in the number of intrusions of negative effect, one would expect under the evaluative condition that the responses of the HA *Ss* would be less appropriate in the direction of affect expressed to the questions asked. Thus, the LA and the HA *Ss* would differ most in the number of negative affective statements made to questions that would seem to call for positive affective statements only and in the number of positive affective statements made to questions that would seem to call for negative affective statements only.

Another difference that we expected to find was in the source of the expressed affect as indicated by the *S*. Doris (1) found that blame was assigned to others and to the self more often by HA than by LA *Ss* and that self-blame was the stronger of the two blame tendencies for the HA *Ss*. Thus, we expected that the HA *Ss* would attribute their expressed feelings to themselves to a greater extent than would the LA *Ss*.

A further effect of the HA *S*'s preoccupation with his anxiety feelings would be his lessened interest or ability to give a complete and organized response to the interview questions compared to the LA *Ss*. From this expectation we made two predictions: first, that the responses of the HA *Ss* would be less well organized, thus less comprehensible, than the responses of the LA *Ss*; second, that the HA *Ss* would include fewer details (time, place, people, etc.) in their responses than the LA *Ss*.

It was also expected that, in addition to these stylistic differences in verbal expression as a function of anxiety, measurable differences in voice quality should be related to our independent variables of anxiety level and interview atmosphere.

The main purpose of the present study was, then, to extend past findings on the influence of anxiety on performance in a testlike situation to a face-to-face interview situation where the *S*'s performance consisted of his organization of a complex verbal response given to open-ended questions.

METHOD

Children were matched on IQ, sex, and grade and randomly assigned to one of three groups which varied in anxiety level (low, medium, and high). Standardized interviews were administered to each *S* and were scored on several dimensions of stylistic performance in addition to the expression of affect. The *Ss*' expectations about the interview situation were experimentally manipulated by means of permissive or evaluative instructions. Thus, the research design is a mixed factorial arrangement: 3 (anxiety levels) \times 2 (sex) \times 2 (administration treatments) with four *Ss* per cell.

Subjects

From a population of over 500 third grade children tested in 11 elementary schools in Hamden, Connecticut, a sample of 48 were selected for the present study. Six months prior to the start of this study the entire sample population received the Sarason Test Anxiety Scale for Children (TASC) (6) and the Lorge-Thorndike Nonverbal IQ battery (Form A). Ss in the highest, lowest, and middle 15 per cent of the anxiety scale distribution were designated as high anxious (scores from 16 and over), low anxious (scores from 0 to 3), and moderately anxious (scores from 8 to 10), respectively. Eight sets of males (of three anxiety levels each) and eight sets of females (of three anxiety levels each) were finally selected to be Ss in the present study.

Procedure

Interview administration. The interviews, which averaged 30 minutes in duration, consisted of a series of questions with standardized probes. They were administered individually in a school room by one of two interviewers, who were, of course, unaware of the TASC score of the Ss. The questions varied from specific, "affect-loaded" ones like, "Tell me about a time when you had a fight or an argument with one of your good friends," to general, neutral ones like, "Tell me about the different things you did last summer." The entire interview was tape-recorded to facilitate complete and accurate reporting and scoring.

The questions were administered in the following order:

1. Tell me about the different things you did last summer.
2. What did you think about coming back to school after last summer?
3. Tell me what you think about school.
4. What are the things you like best about school?
5. What are the things that you do not like about school?
6. What do you like to play best outside of school?
7. Tell me about your teacher last year.
8. Tell me something about your best friend.
9. What do you like about two other friends (mentioned by S)?
10. Tell me about a time when you had a fight or an argument with one of your good friends.
11. What are the things you like to do with your father best?
12. What are the things you like to do with your mother best?
13. How would you describe your parents if you were writing about them to a classmate?
14. Tell me about something which happened to you which made you very happy.
15. Tell me about something which happened to you which made you very unhappy.
16. Tell me about a time when you were really worrying about something.
17. Tell me some things you think might make a child feel like crying, laughing, and smiling.²

² Because the questions about school (2-6) generally yielded stereotyped responses from all Ss, they were not even scored.

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Since the *Ss* varied in their anxiety specific to tests and test situations, it was felt that the experimental manipulation of the *Ss*' perception of the evaluative nature of the interview situation would maximize the efficacy of the anxiety variable. Accordingly, half of the *Ss* were led to believe that the interviewer was evaluating them and that they would be given a test following the interview. These expectations were guided by the following instructions:

You have been asked to come here today to have a test. I am testing a lot of boys and girls your age, and I will compare how well you do with how well the other children do. I will not tell your teacher or your parents how you do on the test, only you and I will know how you do. *Before* giving you the test, I would like to ask you some questions about yourself. This is not part of the test, just some questions about how you think and feel about different things. When we have finished talking, then I will ask you to play a picture and a word game, and then you will be given the test. Is that clear? You will be given a test to find out how well you do as compared to other children your age. But first, I want to ask you some questions, which are *not* part of the test.

The interview was conducted in a generally authoritative tone, with the interviewer maintaining his "distance" from *S*. Upon completion of the session, the *Ss* were told that time had run short and it would not be possible to give the test; however, since they had talked a lot already it would not be necessary anyway. The interviewer was then friendly, supportive, and encouraging to every *S*.

For the other half of the *Ss* the interview situation was quite permissive and nonevaluative in terms of instructions, the manner in which the questions were asked, and in frequent reference to *S* by his first name. The instructions stated:

(*S*'s first name), we are talking to a lot of children your age, in your school, and in other schools. We are talking about how they think and feel about some things. Whatever we talk about will be just between the two of us. This is *not* a test. I do not want to find out if you know your lessons, we are just going to talk about how you think and feel about some things. When we have finished talking then we can play a kind of game with pictures and words. Do you understand me, (*S*'s first name)? I just want to talk to you about how you think and feel about some things.

Since spontaneous verbal expression of affective words depends, in part, on acquaintance with the words, it was necessary to assess independently of their interview responses the *Ss*' knowledge of and ability in appropriately applying affective labels within the general interview situation. Therefore, following the interview proper, each child was asked the meaning of 21 words, 12 of which were affective words (e.g., happy, excited, worry, hate) and nine of which were nonaffective words (e.g., animal, food, vehicle).

Finally, each child was asked to select which one photo from each of 21 sets of three of the Frois-Wittmann pictures (3) best expressed the af-

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tive label supplied by the interviewer (e.g., "Which man is a suspicious man?"). All of the affective words in the vocabulary test plus nine additional ones were used in this task. Each of these two tasks averaged 10 minutes in duration.

Interview Scoring

Two judges independently scored the interviews directly from the tapes. Intervals of about two months each separated the scoring of question 1 (block 1) for all *Ss* and the scoring of the second block of questions (four questions) and the third block of questions (seven questions).

After pretesting with six *Ss*, the following scoring categories were adopted for use in the present study:

I. Affect

a. *Number and type of affect statements.* Frequencies were obtained of affective statements made to questions with positive and negative affect "pull" (i.e., to questions designed to elicit positive affective responses, like "Tell me about your best friend," and those designed to elicit negative responses, like "Tell me about a time you were worrying about something"). Further, each affective statement was placed in one of five categories according to its direction (i.e., negative, positive, or predominantly mixed) and its extremity. Thus, the five categories used were extreme positive, moderate positive, predominantly mixed, moderately negative, and extreme negative.

b. *Source or origin of the affect mentioned.* While *Ss* many times mentioned their own reactions to various things, they also mentioned how others felt. Thus, all affective statements could be placed into one of two categories according to the source of the affect. The source might either be the self only or some other person.

c. *Discrepancy between manifest content and affect expressed.* A 50-point scale was used ranging from "no discrepancy" to "maximum discrepancy." This was a measure of the appropriateness of the *S*'s affect to what he was talking about and was not necessarily related to the appropriateness of the affect of what he said to what the question seemed to call for.

II. Stylistic Dimensions

a. *Voice*

1. *Degree of animation:* a 50-point scale from "complete animation" to "complete monotone." This scale ranged from a voice which had a markedly animated quality, characteristic of one reading for a dramatic tryout, to a monotone characteristic of someone proof-reading aloud.
2. *Direction of animation:* a 40-point scale from "strongly positive" (i.e., a "happy," "cheerful," "excited" voice) to "strongly negative" (i.e., a "sad," "frightened" or "depressed" voice).

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3. *Forcefulness*: a 30-point scale from "forceful and persuasive" through "undistinguished" to "mousy" on which voices were rated from those with a quality of forcefulness and certainty (characteristic of someone who had something to say and wanted to be heard) to those which were weak and timid (characteristic of someone who was holding back or was speaking from inside a well-insulated room).

b. *Specificity of response*: a 30-point scale from "very specific" to "very general." A very specific response included sufficient detail to know what, where, when, how, and with whom an activity or experience was undertaken, while a very general response was a minimal answer to an interview question which was relatively unrevealing (e.g., "I went for a trip").

c. *Comprehensibility of response*: a 30-point scale from "completely comprehensible" to "mostly incomprehensible." This scale was a measure of the judges' ability to understand what the Ss said. When the Ss mumbled, were illogical, spoke in a very low voice (or were poorly tape-recorded), they were given "incomprehensible" scores.

d. *Concreteness vs. abstractness of descriptions of people*. Ss' descriptions of their teachers, parents, and best friends were rated as being concrete if they dealt primarily with objective, visible physical aspects of the individuals or abstract if they dealt primarily with inferences about less superficial aspects of these people, such as personality characteristics.

RESULTS

Reliability

Two judges independently scored (direct from the tape-recordings) the dependent variables for all Ss over the first two blocks of questions (question 1 and questions 7 to 10).³ Separate reliability estimates were thus made for each variable and for each block. For the stylistic variables (voice forcefulness, specificity of response, and comprehensibility) Pearson product-moment correlations were computed between the independent ratings and are presented in Table 1. It is evident from inspection of the table that these variables were scored with substantial reliability, especially on the second block of questions. The increase in reliability from the first to the second block of questions can probably be attributed to a "practice" effect, with the judges improving as they established familiarity with the scoring procedures and an adequate frame of reference.

The variable of the number of affect statements made was scored with even greater reliability. On 85 per cent of the total instances, the judges were in agreement as to the presence of the expression of affect in block 1.

³ The judges were, of course, unaware of the Ss' TASC score, as was pointed up by their unsuccessful attempt to place each S in his correct anxiety level (LA, MA, or HA).

TABLE I
PRODUCT-MOMENT RELIABILITY COEFFICIENTS

Variable	Block 1	Block 2
Voice Forcefulness .....	.51	.73
Specificity .....	.90	.91
Comprehensibility .....	.60	.80

This agreement rose to 92 per cent for block 2 and was essentially the same for instances of positive and negative *affect expression*.

After the reliability between judges' ratings was established on questions in blocks 1 and 2, questions in block 3 were scored by a single judge.

Checks on the Manipulation and the Experimental Conditions

In order to assess the efficacy of the manipulation of the evaluative and permissive conditions under which the interviews were conducted, three checks were used: First, the two sets of instructions were independently rated from the tapes for the effectiveness with which they were presented, and no group differences were found. Secondly, the tone of the interviewer as he conducted the interview was rated along a permissive-evaluative dimension (i.e., how well the interviewer played the role defined for him according to the condition under which he was administering the interviews). The differences between the judged tone of the interviewers toward the *Ss* under the two conditions was very large ($F = 63.74, p < .001$) and in the appropriate direction. A further check on the quality of the interviews was the rating of the amount of direction the interviewer gave *S* over and above that demanded by the standardized interview conditions. Again, no group differences were found, so that any extraneous direction being given was randomly distributed among all groups. There was, however, a much larger difference in amount of direction given by the interviewers between the first two blocks than between blocks 2 and 3. This might reflect changes in the interviewer over time (e.g., an attempt to establish rapport initially and then a closer adherence to the interview form⁴). Thus, although no direct measure was obtained of *Ss*' perception of the manipulation, it can be established that the different sets of instructions were presented with equal effectiveness, that the interviewers conducted the two types of interviews using a different tone and manner for each, and that there was no more direction given in the permissive condition than in the evaluative one.

⁴ It is interesting to note that, although the two interviewers were of opposite sex, there were no differences between the two groups of *Ss* that each interviewed on any of the dependent variables.

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Since the focus of the present study was on the effects of anxiety upon the expression of verbal affect, it was thought necessary to demonstrate first that the groups did not differ in their *cognitive understanding* and *cognitive ability* in applying affect labels to affect states. Although Ss were matched on IQs, there might still be group differences in knowledge of affective words which are not measured by a general IQ test. Thus, following the interview, a vocabulary test was given which included affect as well as nonaffect words. There were no group differences in the ability to define affective words. In order to assess the Ss' ability in applying affective labels, the photo-judgment task was given after the vocabulary task, and again no differences were found between any of the groups. Therefore, any systematic differences between groups in the overt expression of affect during the interview are not attributable to these sources.

Affective Content of Responses

An analysis of variance showed no group differences in the total number of affective statements made to all of the questions. This total number of affective statements was then analyzed into positive and negative responses with results presented in Table 2. There are no group differences in the expression of positive affect. However, differences emerge when one looks at the expression of negative affect. Inspection of Table 2 reveals an interaction between anxiety and conditions, with the HA group expressing significantly more negative affect than the LA group under the evaluative condition ($t = 1.95, p < .05$, one-tailed test), while under the permissive condition the LA group expresses more negative affect than the HA group (not significant, $t = 1.24, p < .10$, one-tailed test). Further, the HA Ss under the evaluative condition expressed more negative affect than did the HA Ss under the permissive condition ($t = 2.56, p < .02$, one-tailed test). This interaction approaches statistical significance ($F = 2.95, p < .07$, $df = 2/42$) when all three anxiety groups are considered. When the divergent MA group is omitted in the analysis, the interaction between

TABLE 2
VERBAL EXPRESSION OF AFFECT

		TOTAL POSITIVE			TOTAL NEGATIVE		
		LA	MA	HA	LA	MA	HA
Permissive	Mean	13.9	12.9	13.5	7.4	5.4	4.8
	SD	4.6	5.7	6.4	5.5	3.7	2.4
Evaluative	Mean	14.4	16.0	15.0	5.1	4.9	8.8
	SD	4.5	6.7	5.3	3.2	2.7	4.1

anxiety and conditions is statistically significant beyond the .05 level ($F = 4.94$, $df = 1/28$).

A further refinement of this analysis was possible on the basis of whether the positive or negative affect expressed was made to questions with positive "pull" (e.g., "Tell me something which made you happy") or to those with negative "pull" (e.g., "Tell me something which made you very unhappy"). There were no differences between groups when the responses were in a direction appropriate to the question. However, significant group differences emerged when the responses were in a direction inappropriate to that called for by the affective pull of the question. Table 3 reveals a highly significant interaction between anxiety level and experimental condition for the expression of inappropriate affect ($F = 10.22$, $p < .001$, $df = 1/42$). Affect expressed is more inappropriate as anxiety increases under evaluative conditions, but more inappropriate as anxiety decreases under permissive conditions. Both trends are of similar strength.

TABLE 3
EXPRESSION OF INAPPROPRIATE AFFECT

		LA	MA	HA
Permissive	Mean	4.6	2.5	1.6
	SD	3.3	1.6	1.2
Evaluative	Mean	1.6	3.0	5.0
	SD	1.2	1.8	2.2

The number of negative affective statements made to positive "pull" questions contributed more heavily to the obtained group differences in inappropriate affect expression than did the number of positive affective statements to negative "pull" questions.

An additional analysis was done of the extremity of the affect expressed to both positive and negative "pull" questions. The differences that were found were all consistent with the above trends, though separate statistical analysis was not meaningful because of the small total number of instances of extreme negative affect. However, it is interesting to note that there were no instances of extreme negative affective statements made to positive "pull" questions (inappropriate affect) by the LA group under the evaluative conditions, while five of the eight HA Ss under the evaluative conditions made a total of 12 such statements.

Each affective statement was scored as to its source or reference. Difference scores were then constructed for each *S* which indicated the relative frequency of attributing the source of the affect to the self or to others. An analysis of variance of these scores, contrary to our prediction, revealed no

significant differences between anxiety groups. A significant difference ($F = 5.85, p < .05, df = 1/42$) was found between experimental conditions, with Ss under the evaluative condition indicating themselves as the source of their expressed affect relatively more often than Ss under the permissive condition. The Ss under the latter condition attributed the affect to themselves equally as often as they did to others. There were no differences related to whether or not the affect expressed was positive or negative or to whether or not the affect was given in response to positive or negative "pull" questions. No sex differences were found in the above analyses.

Stylistic Variables

The following variables were analyzed by means of an extension of Lindquist's (4) type 1 analysis of variance design which permitted partitioning of the within-group variance due to questions and blocks as well as their interactions with sex, anxiety and treatment: (a) specificity of response, (b) discrepancy between affect expressed and content of response, (c) degree and direction of voice animation, (d) voice forcefulness, and (e) comprehensibility.

No differences in specificity or affect content were obtained. While no differences were noted for degree and direction of voice animation, voice forcefulness showed a significant interaction between anxiety and sex: HA boys were less forceful than LA boys, but HA girls were judged more forceful in voice than were LA girls ($F = 4.24, p < .05$). No effect of experimental treatments was in evidence.

As was expected, HA Ss were rated more incomprehensible than LA Ss ($F = 3.75, p < .05$), and the linear trend observed among the three anxiety groups was highly significant ($F = 7.39, p < .01$). This difference was slightly (not significantly) greater under evaluative than permissive conditions.

A final stylistic dimension of performance suggested by the research of Sigel⁵ on conceptual modes of verbal expression is the use of concrete versus abstract descriptions of people important to S (e.g., parents, teacher, best friend). Table 4 presents a comparison of the number of concrete and the number of abstract descriptions given by Ss during the interview. A "concrete" description is one in terms of overt, objective, visible, physical characteristics (e.g., height, weight, hair, facial appearance). "Abstract" refers to descriptions which require S to make an inference about some attribute of the person, usually a personality characteristic. These descriptions are thus more subjective, less superficial, and generally deal with traits which are more important for social interaction than those mentioned in concrete descriptions.

Difference scores between the number of abstract and the number of concrete descriptions used by each S were computed. An analysis of variance

⁵ Personal communication, 1959.

of these difference scores, omitting the MA Ss, yielded significant differences between anxiety groups and near significant differences between conditions. The LA Ss tended to be more abstract than concrete in their descriptions; the HA children tended to be relatively more concrete ($F = 5.92, p < .025, df = 1/28$). Similarly, under permissive conditions relatively more abstract descriptions were given than under evaluative conditions ($F = 3.24, p < .10, df = 1/28$). Table 4 presents the scores representing the *difference* between use of abstract and concrete descriptions for the three anxiety groups under each experimental condition. Since approximately the same total number of descriptions were given by Ss in each group, it can be concluded from this table that LA, permissive Ss describe other people in terms of abstract characteristics, while HA, evaluative Ss use relatively more concrete characteristics to describe other people. Thus, both anxiety and the experimental manipulation determine whether children will tend to prefer abstract or concrete descriptions of people who are important to them. With the inclusion of the MA group the analysis yielded nonsignificant results due primarily to the divergent scores of the MA Ss under the permissive condition. Again, no sex differences were found.

TABLE 4
ABSTRACT VERSUS CONCRETE MODES OF DESCRIPTIONS*

		LA	MA	HA
Permissive	Mean	17.6	12.8	14.4
	SD	3.4	6.0	4.6
Evaluative	Mean	15.1	14.8	12.6
	SD	2.4	3.5	2.5

* Scores represent the difference between abstract and concrete descriptions; thus, larger numbers indicate more abstract descriptions.

DISCUSSION

As has been elaborated in a previous publication (6), we have accepted the conception of anxiety as a signal to an individual that the strength of certain thoughts or feelings that he may be experiencing have increased to the point that the behavior they might elicit is unacceptable and dangerous. This signal has at least two major properties (2): it is a phenomenon of which the child is acutely conscious, and it is of a decidedly uncomfortable nature. The situations that may cue off anxiety are naturally varied and differ for each individual. Our Ss were selected on the basis of how much anxiety they admitted experiencing in the school situation. One of the two experimental conditions used in this study represented an attempt to rein-

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force the effects of a very important aspect of this situation, the process of being evaluated. Thus, it was felt that, if a child admitted to a concern over tests and testing situations, any indication that he was in fact faced with the prospect of being thrust into such a test situation would increase his anxiety. This would have certain effects on his behavior. Specifically, the major expected effects would be intrusions of negative feelings into his verbal productions and also a lessened ability to bring together thoughts into comprehensible verbal response. The first part of the expectation was borne out in that it was found that the HA Ss made more references to negative affect under the evaluative condition than did the HA Ss under the permissive condition and also more than the LA Ss made under the evaluative condition. It was further found that this difference was accentuated when the questions put to the child were judged to be positive "pull" questions. When negative affect was appropriate (i.e., as responses to negative "pull" questions), very little difference between groups was found in the number of such statements made. This might suggest that the affect expressed by HA Ss under the evaluative condition tends, due to the pressure of inner feelings, to be less appropriate to the specific external situation. The specific measure of affect-content discrepancy used in the study failed to show differences that would support the above. Actually, this measure seems to have confounded two kinds of discrepancy: first, the discrepancy between the affect expressed in the verbal response and what would normally be called for by the question itself; and second, the discrepancy between the affect expressed and the actual content of the verbal response, disregarding what the question would seem to call for. Such a confounding could conceivably lead to the above lack of results.

It can be noted from Table 2 that, not only do the HA Ss under evaluative conditions make a large number of negative affective statements, as was initially expected, but also the LA Ss under permissive conditions make a large number of such statements. This finding was surprising, and we have no ready explanations. One conceivable explanation of this unexpected result might lie in the possibility that the tendency to deny anxiety feelings was unevenly distributed among Ss in the various groups. It has long been our opinion that the measurement of the defensive tendency is the bottleneck in the development of more effective personality screening procedures. Ruebush (5), using a measure of defensiveness, found, that among Ss who received low TASC scores, those who also received high defensiveness scores performed more like HA Ss and less like LA Ss who received low defensiveness scores. This further breakdown of levels of anxiety into categories of defensiveness will be followed up in a subsequent study.

Additional differences were expected in the specificity of the Ss' responses. Only a trend barely suggestive of an interaction between anxiety and sex was found: the boys scored in the expected direction, that is, the LA boys were more specific in their responses than were the HA boys. This disappointing result might be due to the fact that the measure itself was

too broad and perhaps brought together opposite trends by giving the same weight in the final score to each of the various details looked for.

Analyses of the three voice categories showed that the pattern of results for all three were similar but with only the differences between groups in the voice forcefulness category reaching significance. As with the measure of specificity, an interaction between anxiety and sex was found with the trend among the boys being in the expected direction (i.e., LA boys being judged more forceful than the HA boys) while the trend among the girls was in the reverse direction. This sex difference parallels other findings where the HA girls actually seem to perform, at least in some ways, in a manner more similar to the LA boys than to the HA boys. Very probably there are differences in inferences to be drawn from a girl's admitting experiencing anxiety in the school situation than a boy's admitting the same thing. For girls such feelings are more acceptable socially. In fact, a girl who denies having any feelings of anxiety might almost be thought to be stepping out of her expected role. In any event, the systematic investigation of the measurement and subsequent effect of anxiety in behavior as it differentially influences the two sexes is another area deserving more attention.

Over-all, *Ss* in the evaluative condition gave relatively more concrete responses than *Ss* in the permissive condition. Also, HA *Ss* in the evaluative condition gave relatively more concrete responses than did the LA *Ss* in the same condition. When this last finding is viewed in the context of our other results (e.g., comprehensibility, appropriateness of affect, etc.), it suggests that the marked concreteness of the HA *Ss* reflects in some way the effects of interfering factors in performance under stress. It is our opinion, based on previous studies, that the concreteness of the HA *Ss* is a reflection of their prepotent tendencies to respond cautiously.

The inclusion of a moderate anxiety (MA) group was intended to supply information as to whether TASC score was linearly related to our various dependent variables. Unfortunately, at least for the sake of simplicity, more questions seem to have been raised than have been answered. On some of the measures, notably comprehension, it was demonstrated that there exists a linear trend over all three anxiety groups. However, with other measures such as abstract vs. concrete descriptions of people and number of affective statements made, it was found that the MA group's score fell below or above the LA and HA group scores. At this point, such disparate results are difficult to explain. However, it may very well be that the MA group is made up in general of individuals whose performance on certain tasks is better than the performance of the other two anxiety groups due to their specific mode of handling feelings of anxiety. On the one hand, because they have moderate scores on the TASC, they cannot be thought of as generally denying their concerns of the school situation; but yet their TASC scores are low enough to indicate that probably they are able to handle such concerns to the extent that they would not interfere with their performance on school tests. Again, the necessity is pointed up of employing

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a measure of defensiveness to further isolate the relevant factors at work both in determining an individual's TASC score itself and in determining the effects on behavior of the anxiety that is reflected in that score.

SUMMARY

In order to study the relation between anxiety and certain aspects of verbal behavior (especially expression of affect) standardized interviews were administered to 48 third grade children of both sexes, matched for IQ, but varying in their level of test anxiety. The Ss' perception of the interview situation was manipulated by evaluative or permissive instructions. The evaluative treatment was designed to cue off anxiety, and the permissive treatment was designed to alleviate anxiety.

The major findings were that HA children in an evaluative interview situation express more negative affect than LA children in the same situation, and that this difference does not exist under a permissive interview situation. This difference is accentuated when the expression of negative affect is inappropriate to the stimulus question. Further, this difference seems to become greater as the negative affect becomes more extreme. In describing other people who are important to him, the anxious child tends to be relatively more concrete in his descriptions than the nonanxious child, and this difference is enhanced by the experimental treatment. The responses of the HA Ss were more incomprehensible than those of the LA Ss under both experimental conditions. For the variable of voice forcefulness there was a significant interaction between sex and anxiety, with the HA boys being least forceful, while the HA girls were the most forceful.

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RELATION OF OBJECT CURIOSITY TO PSYCHOLOGICAL ADJUSTMENT IN CHILDREN¹

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During recent years there has been considerable research interest in the related topics of exploratory behavior, curiosity, and the tendency to seek and maintain novelty in perception. Most of the experiments in this general area have dealt with subhuman species: thus, Harlow and his collaborators (7, 8) have emphasized the importance of "curiosity-investigatory" motives in monkeys; and Montgomery and his associates (17, 18, 19) have demonstrated the motive power of what they term the "exploratory drive" in rats. There have been only a few studies concerned with curiosity in humans: Berlyne (1, 2, 3) investigated the stimulus factors related to curiosity in adults; Kagan, Sontag, Baker, and Nelson (10) found IQ changes in children to be related to curiosity themes on the TAT; and one of us (14) presented tentative evidence that anxiety and curiosity are negatively related in psychiatric patients. For brief reviews of research in the whole area of exploratory behavior the reader is referred to Berlyne (4) and Butler (5).

The manifest fact of curiosity in humans has been taken into account by many theorists, including James (9), McDougall (12), Troland (20), Linton (11), Maslow (16), and the psychoanalysts (6). One of the present authors has proposed a conceptualization of human motivation which to a considerable degree is built around the tendency of individuals to seek novelty in their perception. This point of view, which is more fully described

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¹ This study was made possible through the assistance and cooperation of Mr. Anthony L. Rose, Superintendent of Portola Valley School District.

² Shortly after the completion of the collection of data for this study, Miss Caryl Pietila was killed in an automobile accident. She was an understanding teacher, a gifted research worker, and an outstanding person.

elsewhere (13, 14, 15), assumes that persons have inherent tendencies to seek novel percepts. It also assumes that persons tend to assimilate incoming percepts into their apperceptive masses. The concept of assimilation refers to the incorporation and integration of incoming percepts into harmonious and concordant relationships with existent perceptual systems. The process of assimilating the continuing input of percepts which one receives in the course of living would be expected to proceed smoothly as long as there were no major incongruencies between incoming percepts and the schemata according to which they would be assimilated, but in the presence of outstanding incongruencies assimilation would be difficult if not impossible. Thus, material about which one is ambivalent or which represents problem areas for him would be difficult to assimilate. It is assumed that unassimilated percepts tend to accumulate and that anxiety is a positive function of the quantity of unassimilated perceptual material. The theory proposes that the tendency to obtain novel percepts—in other terms, curiosity or exploratory behavior—is attenuated as the magnitude of unassimilated percepts becomes greater.

A test of this hypothesis with children as subjects seems particularly appropriate because of the generally accepted view—which perhaps has the status of an item of folk wisdom—that curiosity is particularly prominent in childhood. In order to test the hypothesis directly it would be necessary to measure both curiosity and magnitude of unassimilated percepts. Both of these present considerable difficulties. With regard to curiosity it is not known whether or to what degree curiosity is a general trait, and it is conceivable that a child might be curious concerning one area of the environment and incurious concerning another. Or he might express curiosity for objects but not for abstract ideas, and so on. The technique which we used in the present study to measure curiosity concerned exploratory behavior with objects, and, while it is our presumption that this measure is at least somewhat indicative of curiosity generally, it seems best, in the interests of scientific accuracy, to refer to the subject of our measure as *object curiosity*.

Rather than attempting to measure directly the quantity of unassimilated percepts—or anxiety, which this quantity is held to underlie—we obtained estimates of several different aspects of psychological adjustment. This procedure was based on the assumption that in general a child who is maladjusted has a greater amount of unassimilated material than a child who is well adjusted. Such an assumption seems quite reasonable: the maladjusted child is likely to be characterized by emotional ambivalences which make difficult the assimilation of percepts in important areas of experience; that is, he is likely to have undergone experiences which he has not been able to work through or to integrate into his personality. It is true, of course, that on occasion well-adjusted children would be expected to have considerable unassimilated perceptual material, but in general the present assumption seems justified.

The specific hypothesis tested in the present study was that object curiosity in children is negatively related to psychological maladjustment, or, to word it differently, that curiosity is positively related to adequacy of adjustment. This prediction, while relevant to the conceptualization from which it was derived, clearly is not crucial to that particular theory and has implications beyond that theory. For example, the question as to whether curiosity is inhibited by psychological maladjustment is of immediate significance to educators.

METHOD

Subjects

Thirty children, 14 girls and 16 boys, of mean age 11.5 served as subjects. These students comprised the sixth grade class at Portola Valley Elementary School, located in an upper middle class community near Palo Alto. The achievement level of this class as a whole may be estimated from results of a May 1959 administration of the California Achievement Tests which placed approximately 88 per cent of the class above sixth grade level and 40 per cent above eighth grade.

Procedure

Data were gathered from two main sources: ratings made by the sixth grade teacher on 10 behavioral variables and curiosity scores obtained from observing each *S* in a special test situation. The examiner (MA) who administered the curiosity test was introduced to the group by their teacher (CP) on a visit to the school prior to the testing period. At that time, the class was told that the purpose of the study was to see how well they could identify objects by manipulating them without looking at them, but curiosity *per se* was not mentioned.

Measure of object curiosity. The technique used for measuring object curiosity was a modification of that used in previous studies (14). Essentially, it involved a systematic observation of *S*'s spontaneous exploratory behavior when presented with a number of interesting objects.

The experimental material consisted of the following: (a) the Object Box, a green wooden box 18 in. by 10 in. by 10½ in. in size, covered in front with heavy green curtains which parted at the center and open at the back; (b) the Free Play Box, a green wooden box 17 in. by 17 in. by 3¼ in. in size; it was open at the top and consisted, in egg-crate fashion, of 16 cubicles, each 4 in. by 4 in. by 3 in. in size; and (c) thirty-five small objects, such as a miniature camera, a small stapler, a harp, a toy motorcycle, and so on.

Individual sessions were scheduled 30 minutes apart. The testing sequence began as each *S*, when his turn came, was escorted from his classroom by *E* to a small separate building, sometimes used as a library and familiar to the students. In the testing room, *S* was seated at a table facing the Object Box, with *E* sitting around the corner of the table to *S*'s right.

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The experimental session consisted of two phases. First, there was an identification task during which *E* placed 12 objects, one at a time, inside the Object Box. She did this by inserting the object through the open back of the box so that the child could not see the objects. *S* reached his hand into the box, through the opening in the curtain, and attempted to identify each object solely on the basis of cues received from feeling it and manipulating it. After each guess, *S* was free to take the object out of the box and look at it or play with it until the next object was put in the box for his identification. *E* unobtrusively observed the extent of *S*'s exploratory behavior with each object, according to a detailed, predetermined schedule on which possible manipulations of each object were listed. For example, as an *S* observed the miniature flashlight, one point was scored for each of the following manipulations: move top to different angle, unscrew top, unscrew bottom, remove bulb, clip onto something, install battery, turn on, read writing on side. In addition to scoring various kinds of manipulations of an object, one point was given for each meaningful question about an object, and one point was given for each comment that implied curiosity (e.g., "These flashlights are manufactured in Germany.") After the 12 objects had been presented, *S* was told that the "test" was over and that, while *E* prepared scoring sheets and objects for the next child, *S* would be free to amuse himself for a few minutes. At this time, *S* was shown to another table on which there was a box (Free Play Box) containing 23 additional objects which he might examine while waiting if he cared to do so. The period of free play that followed was timed by *E* for 10 minutes, during which time she unobtrusively watched *S*'s manipulations of the objects and recorded score points according to predetermined criteria, as illustrated by the miniature flashlight example above.

The *object curiosity score* consisted of the sum of all points earned by *S* in exploring the 35 objects. An estimate of the reliability of this score was obtained by the split-half method. The objects were divided into two groups, matched as closely as possible in terms of (a) the number of possible points which could be earned for each of the objects (e.g., the real miniature camera had many possible responses whereas the rubber screw driver had few), (b) whether the objects were used in the identification or the free play phase, and (c) the extent to which the objects appeared to be of primary interest to boys or to girls. The correlation between the two halves, as corrected by the Spearman-Brown formula, was .87. This coefficient is of the order of that (.96) reported previously (14) for a similar procedure. It does not directly concern the reliability of scoring, but this can be presumed to be quite high due to the detailed nature of the scoring criteria. In the one of the previous studies (14) in which two judges were used, the correlation between scores assigned by the two judges was .99.

Ratings of behavior. The estimates of psychological adjustment and maladjustment were based upon ratings made by the classroom teacher. Because of the complex nature of psychological adjustment, six different

behavioral rating scales were utilized, as follows: nervous behavior, worry over achievement, classroom adjustment, adjustment to teacher, adjustment to peers, and over-all psychological health. In addition, and for general interest rather than for specific pertinence to the hypothesis under study, ratings were obtained on scholastic motivation, activity level, creativity and originality, and curiosity, with the prediction in each case being a positive relation with object curiosity. While the rater, as a co-author, was of course familiar with the general design of the study, she had not seen and had no direct knowledge of the method of administering or scoring the object curiosity test. The ratings were made in the latter part of the school year so that the teacher was quite familiar with each student. Ratings were made on six-point scales, with the 30 Ss distributed as much as possible about the six points so as to approximate a normal distribution (1:5:10:10:5:1). Detailed definitions of the behavioral variables were prepared for the rater's guidance.³

The fact that only one rater was used is a shortcoming in the present study, but the fact is that no persons other than the teacher were sufficiently familiar with the Ss to evaluate them. Some indication of the reliability of the ratings can be obtained by comparing the ratings assigned on closely similar variables: thus, "creativity and originality" appears to be logically similar to "curiosity," and these two ratings were correlated .76. Similarly, "maladjustment in classroom" and "maladjustment to teacher" were correlated .83.

RESULTS AND DISCUSSION

Table 1 presents the correlations between object curiosity and the behavioral variables. It is obvious that our primary hypothesis of a positive relation between object curiosity and psychological adjustment and of a negative relation between curiosity and maladjustment is supported. While of modest magnitude, all of the correlations are in the predicted direction, and most of them are statistically significant. The findings thus give indirect support to the theoretical interpretation of a negative relation between amount of unassimilated material and strength of the tendency to obtain novel percepts.

From a more immediately practical point of view, the results raise the possibility that those aspects of classroom learning which depend upon curiosity are hindered by the anxieties of the student.⁴ This conclusion appears to have significant implications for educational practice.

³ Duplicated copies of the rating scales, as well as lists of the objects presented for exploration and the detailed instructions to the Ss, can be obtained from the authors upon request.

⁴ This tentative conclusion is different from the common view that maladjusted people are often very creative, indeed that maladjustment somehow contributes to creativity. So far as we are aware, however, this opinion is unencumbered by systematic studies; it is a reasonable hypothesis that, whereas severe maladjustment may sometimes increase motivation for creative productivity, it does not directly facilitate originality.

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TABLE I

PRODUCT-MOMENT CORRELATIONS BETWEEN PSYCHOLOGICAL
ADJUSTMENT AND OBJECT CURIOSITY (N = 30)

	<i>Behavior Variables</i>	<i>Object Curiosity</i>
<i>Psychological Adjustment:</i>		
Over-all Psychological Health		.45*
<i>Psychological Maladjustment:</i>		
Nervous Behavior		-.42*
Worry over Achievement		-.27
Maladjustment in Classroom		-.50*
Maladjustment to Teacher		-.42*
Maladjustment to Peers		-.39**
<i>Other Variables:</i>		
Scholastic Motivation		.43*
Activity Level		.03
Creativity & Originality		.20
Curiosity		.37**

NOTE.—The data for Maladjustment to Peers and Over-all Psychological Adjustment are based on 29 cases.

* Significant at .01 level, one-tailed test.

** Significant at .05 level, one-tailed test.

Curiosity is not necessarily a significant factor in all aspects of classroom learning, however. For the present study we had available California Achievement Test scores obtained about two weeks before the curiosity data. When these scores were correlated with object curiosity data, a product-moment coefficient of .14 was obtained. Presumably aptitude for and skill in rote learning and memory are more important than object curiosity in those aspects of learning measured by the California Achievement Tests. It is also possible that curiosity, but of a sort other than object curiosity, is significant for scholastic achievement as measured by this test.

The present study, while productive of positive findings, should be considered as preliminary rather than as definitive. It was limited by the fact that the measures of adjustment were based completely upon the judgments of one rater and by the fact that the kind of curiosity sampled was rather restricted. The study does indicate, however, that curiosity can be successfully studied in children, and it is hoped that more investigations of this variable will be forthcoming.

SUMMARY

Thirty children in a sixth-grade class were administered a test of object curiosity. The classroom teacher rated each student on a number of variables,

most of them concerned with psychological adjustment. The hypothesis was that object curiosity would be related negatively to maladjustment and positively to adequacy of adjustment. The results supported the hypothesis.

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RELATION BETWEEN ANXIETY AND TWO MEASURES OF SPEED IN A REACTION TIME TASK¹

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A study by Wenar (16) reported a positive relation between anxiety, as defined by the Taylor manifest anxiety scale (MAS) (14), and response speed in a simple reaction time task. This finding was interpreted as indicating that anxiety has motivational properties and as supporting Hullian theory (6) which states that, if the habit factor is held constant, increases in drive level will lead to increases in response strength.

A number of attempts have been made to replicate Wenar's results (1, 4, 5, 7, 8, 12). With the exception of a recent study by Rossi (12), none of these studies report results confirming those of Wenar.

All of the studies have not measured the same responses as reaction time. For example, the Farber and Spence report includes two experiments; in one they measured the amount of time to move the finger from one position to another after the stimulus was presented, and in the other they measured the amount of time from the onset of the stimulus to removing the finger from a button. Some studies have measured the amount of time from onset of stimulus to starting an action (1, 4), another has measured the amount of time to make a movement from one position to another after the stimulus has been presented (4), while most of the studies have used a combination of both as a single measure (5, 7, 8, 12, 16).

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The two separate measures of reaction time seem analogous to the two separate measures of response evocation or starting time and running time taken for rats in a runway. In the case of the runway situation, Spence (13) has pointed out that starting time is much more likely to be affected by competing responses and, therefore, is not as reliable a measure as running time. It would seem reasonable to assume that the same factors might operate in the reaction time task.

The present study is an attempt to determine the relation between anxiety and these two measures of reaction time and, in addition, the relation between the two measures, reaction time (RT) and movement time (MT).

METHOD

Subjects

The Ss were 113 sixth grade children, 57 boys and 56 girls, in a public school. All of the children had taken the children's form of the Taylor manifest anxiety scale (CMAS) (2). There were 13 boys and 13 girls with scores of 10 or below (low anxiety), 31 boys and 29 girls with scores between 11 and 23 inclusive (medium anxiety), and 13 boys and 14 girls with scores of 24 or higher (high anxiety).

Apparatus

A modified reaction time apparatus made by the Lafayette Instrument Co. was used. It consists of a platform 18 in. long and 1 1/4 in. wide divided in the middle by a perpendicular board 1 in. thick, 10 in. high and 1 1/4 in. wide. On S's side of the apparatus was located a microswitch mounted 1 in. above the level of the platform. In the center of the platform, 2 in. above the platform level and 4 1/2 in. from the front edge of the platform, was located a round 3/4 in. diameter button attached by a lever to another smaller button originally used as the response button on this apparatus. On the perpendicular board facing S were two 1 1/2 in. square pieces of glass, one on each side, 7 1/2 in. above the platform and 2 1/4 in. from the side of the board. The glass on S's right was white, and the one on the left was red. Each could be illuminated from behind by a 6.2 volt G. E. flashlight. Only the red light was used in this experiment. On E's side of the perpendicular board was located a three-way switch which was set so that the red light would be activated when E pressed the starting button. A standard electric timer was connected into the circuit such that it was started by E at the same instant as the onset of the stimulus and stopped at the same instant that S lifted his finger off the microswitch. A second standard electric timer in the circuit started at the same time the first one stopped and stopped when S pressed the response button turning off the stimulus. Thus, there was a measure of the time to start (RT) and a measure of time to move from one button to the other (MT).

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Procedure

All Ss were told that the purpose of the experiment was to see how fast they could move their finger from one button to the other. They were told to place the index finger of their preferred hand on the microswitch when *E* said "Ready," and, when the stimulus went on, they were to turn it off by pressing the button as quickly as they could. The *E* gave the ready signal approximately 2 sec. prior to the presentation of the stimulus. All Ss were given three preliminary practice trials to insure their understanding of the instructions. There followed immediately 40 trials for which *E* recorded both RT and MT. The *S* was informed of his time scores following each trial.

RESULTS

A reciprocal transformation was performed on all RT and MT scores in order to help eliminate the skewness of the distribution of scores and to make the results comparable to previous studies. Thus, all the analyses are in terms of speed of response.

Table 1 presents separately the means and standard deviations of the RT speed scores for both sexes and the three levels of anxiety. An analysis of variance of these data over 10 blocks of four trials indicated that boys responded significantly faster than girls and that there was a significant increase in speed over trials but there were no significant effects of anxiety nor interaction effects.²

TABLE I
SPEED OF STARTING SCORES FOR BOYS AND GIRLS AT THE
THREE LEVELS OF ANXIETY

	LEVELS OF ANXIETY					
	LOW		MEDIUM		HIGH	
	Mean	SD	Mean	SD	Mean	SD
Boys	4.3	.7	4.3	.7	4.4	.7
Girls	4.2	.7	4.0	.8	3.7	.8

Table 2 presents separately the means and standard deviations of the MT speed scores for both sexes and the three levels of anxiety. Analysis of variance of these data over 10 blocks of four trials yielded the same results as in the case of the RT scores. There were significant differences

² To allow for proportional groups in the analysis of variance, two boys from the middle anxious group and one girl from the high anxious group were randomly selected and omitted from the analysis.

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TABLE 2

SPEED OF MOVEMENT SCORES FOR BOYS AND GIRLS AT THE THREE LEVELS OF ANXIETY

	LEVELS OF ANXIETY					
	LOW		MEDIUM		HIGH	
	Mean	SD	Mean	SD	Mean	SD
Boys	6.1	1.2	6.0	1.4	5.9	1.8
Girls	5.5	1.1	5.5	1.7	4.7	.7

attributable to sex and trials but no significant anxiety effects nor any interaction effects.

Table 3 presents the Pearson product-moment correlations between the mean RT and MT speed scores for both sexes and the three levels of anxiety. Within the groups only the correlation for the female high anxiety group reaches a statistically significant level of confidence ($p < .05$). The total group correlation of .33 is, however, highly significant ($p < .01$).

To provide an additional check on the relation between the RT and MT measures, Pearson product-moment correlations were run between the 40 RT and MT speed scores obtained for each *S*. The distribution of the 113 correlations ranged from $-.68$ to $.60$ with a mean of $-.03$. Table 4 indicates the mean correlations, based on Fisher's *z* transformation, obtained for the various groups in this study. It is apparent from the table that there is no significant relation between the RT and MT measures for any group or for the total group. While the distribution of these correlations appears relatively symmetrical, it tends to be platykurtic in form. Thirty-eight of

TABLE 3

CORRELATIONS BETWEEN THE MEAN RT AND MT SCORES FOR EACH SEX AT THE THREE LEVELS OF ANXIETY

	LEVELS OF ANXIETY					
	LOW		MEDIUM		HIGH	
	N	r	N	r	N	r
Boys	13	.54	31	.22	13	.27
Girls	13	-.14	29	-.34	14	.61*
Total Group	113	.33**				

* $p < .05$.

** $p < .01$.

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TABLE 4

MEANS OF THE CORRELATIONS BETWEEN RT AND MT FOR SUBJECTS OF EACH SEX AND THREE LEVELS OF ANXIETY

	LEVELS OF ANXIETY					
	LOW		MEDIUM		HIGH	
	N	r	N	r	N	r
Boys	13	.07	31	-.07	13	-.11
Girls	13	.02	29	-.04	14	-.01
Total Group	113	-.03				

the 113 correlations reached the .05 level of significance or higher, 14 in the positive direction and 24 in the negative direction. With an *N* of 40 it is necessary to have a correlation of approximately .31 at the .05 level.

One further estimate of RT-MT relationship was attempted by correlating the two scores for the 113 Ss on each of the 40 trials. The correlations ranged from $-.10$ to $.42$. Only eight of these correlations were greater than the value of $.18$ necessary to reach the .05 level of confidence. There was no apparent trend in the size of the correlations over trials.

DISCUSSION

The finding of no relation between anxiety and reaction speed, regardless of the measure used, supports earlier studies (1, 4, 7). These results do not support the hypothesis derived from Hullian theory (6) that increases in anxiety, or drive, lead to increases in response strength. Since there is a considerable body of evidence, recently summarized by Taylor (15), which supports Hull's theory, using the MAS as a measure of drive, these results would suggest that the reaction time task has some peculiarities not common to the other types of tasks where data have been obtained supporting the theory.

The most obvious difference is the measure of response strength used. For the most part, those studies supporting the theory have used number of correct or conditioned responses as measures of response strength. These are relatively gross measures in terms of the amount they are affected by competing responses aroused by irrelevant variables present in the experimental situation. It has been pointed out (11, 13), however, that speed measures are highly sensitive to competing responses aroused in the experimental situation. It would appear that in order to provide an adequate test of the theory, using speed as a measure of response strength, control of all variations in extraneous stimulation arousing competing responses would

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have to be instituted. Such control would be particularly difficult with human subjects for, as Castaneda (1) has suggested, the human subject may give himself verbal instructions which may compete with the response being measured in the reaction time task. In this connection, it should be noted that Castaneda found a significant relation between amplitude and MAS in the reaction time task although the reaction speed scores showed no significant relation to MAS. Presumably response amplitude is not as sensitive to competing responses.

One might question the CMAS as a measure of anxiety, or drive, in this study although other studies have shown this scale to have a similar relation to performance in learning situations as does the MAS (2, 9). An alternative hypothesis might be that the instructions to respond quickly, given by an adult to a child, may have maximized the general drive level and, therefore, minimized differences attributable to anxiety. In addition, the temporal restriction of responses measured in this task may not have allowed enough variability between subjects for differences to become apparent.

The correlation of .33 between the mean RT and MT speed scores confirms previous findings (10) and indicates that over a series of trials the two measures are related. The fact that the correlation is so low would suggest, however, that two different responses are involved and, therefore, ought to be treated separately in future studies of reaction time. Such is the case with animal studies where different relations frequently are obtained between various independent variables and starting time (response evocation time) and running time in a runway situation.

The average correlations for groups of *Ss* revealed no relation between RT and MT; however, for individual *Ss* there were a large number of correlations which reached a statistically significant level of confidence. This range of correlations, in both the positive and negative direction, would indicate that some variable may be operating to produce differential effects in the response patterns of the *Ss* involved. It would appear that anxiety is not a variable affecting this phenomenon, but the factors which may affect the relation are not apparent on the basis of these data. The fact that the correlations between the two measures remain low over the 40 trials would indicate that the variables which may be involved tend to operate in a consistent manner over a relatively long series of trials.

SUMMARY

The present study was concerned with starting speed and movement speed in a reaction time task as related to scores on the CMAS. A total of 113 sixth grade *Ss*, previously given the CMAS, were given 40 trials in a simple reaction time task. They were required to start with their finger on a microswitch and, upon presentation of a light, press another button. Time was measured from onset of light to release of microswitch and from release of microswitch to pressing the button.

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Boys were significantly faster than girls, and there were significant increases in speed over trials on both measures; however, there were no significant differences attributable to anxiety on either measure. A low but significant correlation was found between the mean RT and MT speed scores for the total group. Correlations between the two measures over trials for individual subjects were distributed over a wide range. The correlations between the two measures for each trial showed no consistent trends over trials.

The results were discussed in terms of the sensitivity of the speed measures to competing responses and the advisability of using both RT and MT measures in future studies.

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ROLE OF DELAY OF REWARD IN SPEED OF SIZE AND FORM DISCRIMINATION LEARNING IN CHILDHOOD^{1,2}

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Numerous studies at the infrahuman level have shown that the strength of a habit is in part a function of the temporal nearness of the reinforcement to the response. Spence (6) has reviewed the literature related to this phenomenon. Perin (5) and, more recently, Logan (4) have shown that learning in the rat is related to the time interval separating reaction from reward. Perin found a negatively accelerated gradient of rate of learning which fell to zero at a delay of about 30 seconds. Logan demonstrated that the rat develops a preference for an act which is followed by a shorter delay of reinforcement.

Lipsitt and Castaneda (3) in an instrumental learning set-up found that young children show a preference for and respond more quickly to a stimulus which has been associated with immediate reinforcement as opposed to another stimulus which is associated with a reinforcement delay. Only one study in this area has been done with children in a discrimination learning arrangement. Terrell (7) found that children can learn a "larger-than" discrimination as quickly under delayed reward conditions as they can when immediately rewarded provided they are able to observe concrete evidence of progress toward the to-be-received reward under the delayed condition. Several factors, however, make this experiment somewhat difficult to interpret. It was contaminated to some extent by a magnitude of reward variable since *Ss* assigned to the immediate reward condition received different amounts of reward, candy, due to wide individual differences in time required to learn. This did not apply to the *Ss* of the delayed reward group since their reward, a small bag of candy, was delivered after they had learned the task. Also, all *Ss* in this study received an immediate reward, a light flash, as an indication of a correct response. Finally, since the candy for both the immediate and delay group *Ss* was administered by *E* in the aforementioned study, there is an apparent lack of precision

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in the time interval between the *S*'s response and the reward. It is believed that these problems are remedied in the experiments described herein. Additionally, two tasks are given *Ss* in each of the two studies reported below, a fact which increases the generality of the results.

The investigations described herein are ones in which the effectiveness of an immediate reward was compared with a delayed reward in the speed of size and form discrimination learning in childhood. The reward employed was a light flash. Two-stimulus problems were used in experiment I, while three-stimulus problems were used in experiment II.

METHOD

Subjects

The *Ss* were 80 children. Twenty kindergartners and 20 first graders were used in each experiment.

Experiment I

Materials. All stimuli were three-dimensional geometric figures. The stimuli for experiment I were as follows: For task 1, two cube boxes having basal areas of 2 and 4 sq. in., respectively; for task 2, a sphere 3 in. in diameter and a pyramid 3 in. in height, 4 in. on each side, and 4 in. on the base. Additional apparatus consisted of a background board and a panel board. The background board was a $13\frac{1}{2}$ by 13 in. piece of plywood with two push-button mounts which were located 2 in. from the right and left edges of the background board and $1\frac{1}{4}$ in. from the front edge of the board. On each trial the stimuli were placed onto the background board immediately in front of the push-button mounts. A piece of terry cloth was glued to the board where the stimuli were placed in order that the sphere would not roll out of position. Batteries and circuits necessary to operate a signal light were concealed under the background board. Locked onto the rear edge of the background board was a $7\frac{1}{8}$ by $10\frac{3}{4}$ in. panel board which contained the signal light. This light was mounted in the center of the panel board, $1\frac{1}{8}$ in. from the top. The circuits were so arranged that a correct response caused the light to go on. The light went on immediately for the immediate reward condition, while there was a delay of 7 sec. for the delayed reward condition. Two Hunter decade type timers controlled the delay of reward and the 1-sec. duration of the light flash.

Design and procedure. There were two categories each of two experimental variables. One variable was the reward condition, while the other was the task factor. The two reward categories were: (a) an immediate light flash after a correct response and (b) a 7-sec. delay in the light flash following a correct response. The two tasks were: (a) a button-pushing response to the larger of two cube-boxes and (b) a button-pushing response to a sphere instead of a pyramid.

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Ss were randomly assigned to two groups of 20 children each. Group I Ss were given the size task under the delayed reward condition and the form task under the immediate reward condition. Group II Ss were given the size task under the immediate reward condition and the form problem with a delayed reward. With this type of design, a Lindquist Type II arrangement (2), all Ss were administered both conditions of each experimental variable, thus making it possible to control for individual differences in evaluating the effects of both the reward and task variables.

Ss of both groups learned the two tasks concurrently. That is, from trial to trial the order of administering the tasks, along with the appropriate reward condition, was counterbalanced according to the following sequence: Size, form, form, size, size, form, size, form, form, size. This procedure minimized contamination of the incentive and task treatments with each other due to order effects. The position of the positive stimulus was randomized alike for each S.

The Ss were tested individually. Each S received the following instructions: "This is a game where we play with these things (E shows the two cube-boxes and the sphere and pyramid to the S). Sometimes these two (E picks up the two cube-boxes) will be put here (E places the cube-boxes on the background board immediately in front of the push buttons) and sometimes these two (E picks up the sphere and pyramid) will be put here (E places the sphere and pyramid on the background board). You are supposed to choose one of these (E again points to the cube-boxes and the sphere and pyramid) and push the button (E points to the push buttons) in front of the one you choose. If you are right, that light will go on (E points to the light on the panel board). If you are wrong, the light will not go on. Now remember, the game is to see how soon you can make the light go on every time." The last sentence was repeated after the fifth trial in a further effort to insure that the Ss understood the point of the task. Training was continued until Ss were correct on six consecutive trials.

Although the main dependent variable of interest was the number of trials to criterion, it was felt it would be a simple matter to test for the effects of immediate and delayed reward on the S's preferences for the two sets of stimuli. Accordingly, just prior to the first trial, and again after the last trial, all Ss were asked to express a preference for the size or form stimulus sets. This measure was obtained by simply asking the S, "Which of these do you like better—these two (E points to cube-boxes) or these two?" (E points to the sphere and the pyramid).

Experiment II

Experiment II was conducted primarily for the purpose of extending the comparison of the delay of reward variable to tasks assumed to be more difficult than those in experiment I. Thus, experiment II provides for a test of the generality of the treatment effect.

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The *Ss*, materials, experimental groups, and design for experiment II were the same as for experiment I with the following exceptions: (a) A different group of 40 *Ss* was used in experiment I. (b) An additional push button was installed midway between the two used in experiment I. (c) The stimuli for experiment II were, for task 1, three cube-boxes having basal areas of 2, 3, and 4.48 sq. in. (d) The correct response for task 1 was a button-pushing response to the largest of the three cube-boxes. (e) The stimuli for task 2 were a cylinder, sphere and a pyramid, all 3 in. in height. (f) The correct response for task 2 was a button-pushing response to the pyramid. (g) In the instructions to the *S* the *E* demonstrated the stimuli appropriate to the three stimulus size and form tasks instead of those for the two stimulus problems of experiment I. And finally, (h) the training was continued until *S* made four consecutively correct responses.

TABLE I
MEANS AND STANDARD DEVIATIONS OF TRIALS TO
CRITERION, ORIGINAL DATA
(Each total treatment group, $N = 40$)

Task	IMMEDIATE		DELAY		TASK TOTALS	
	M	SD	M	SD	M	SD
<i>Experiment I</i>						
Size	6.9	6.1	15.1	14.7	11.0	12.0
Form	6.4	6.1	18.1	13.2	12.2	11.8
Treatment Totals ..	6.6	6.1	16.6	14.0		
<i>Experiment II</i>						
Size	10.7	15.7	27.7	14.2	19.2	17.2
Form	21.9	17.0	17.8	15.0	19.9	16.2
Treatment Totals ..	16.3	7.0	22.7	15.5		

RESULTS

In both experiments an analysis of variance was made on the number of trials to the criterion. Also calculated was a χ^2 test for significance of change in *S*'s preference of the stimulus sets as a function of reward condition. Because of data reported by Boneau (1) it was felt that there was no value to making the usual tests of homogeneity and normality. Boneau reports that particularly when sample *Ns* are equal and more than 30 the *t* test will result in probability figures that are highly accurate even though the normality and homogeneity assumptions may not be met.

Table 1 contains the acquisition data for both experiments. The summary of the variance analysis for experiment I appears in Table 2, for experiment II in Table 3. As can be seen in Table 1, *Ss* learned significantly more

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TABLE 2

ANALYSIS OF VARIANCE OF NUMBER OF TRIALS TO CRITERION
EXPERIMENT I

Source	df	MS	F
Between Subjects	39		
Rewards \times Tasks	1	61.25	.38
Error (b)	38	161.34	
Within Subjects	40		
Rewards	1	2,000.00	24.24***
Tasks	1	31.25	.38
Error (w)	38	82.52	

*** $p < .001$.

quickly in both experiments when rewarded immediately than when given a delayed reward. In experiment I the means were 6.6 and 16.6 for the immediate and delay conditions, respectively, ($p < .001$). In experiment II the treatment means were 16.3 and 22.7 for the immediate and delay conditions, respectively, ($p < .001$). The interaction and task effects were nonsignificant in experiment I. The task effects were nonsignificant, but the interaction was significant ($p < .05$) in experiment II.

The prediction in the test of significance of change in *S*'s stimulus set preferences was that preferences would change in the direction of the set with which immediate reward had been associated. In both experiments the changes were in the predicted direction but nonsignificantly so ($p = .35$) for both experiments.

TABLE 3

ANALYSIS OF VARIANCE OF NUMBER OF TRIALS TO CRITERION
EXPERIMENT II

Source	df	MS	F
Between Subjects	39		
Reward \times Tasks	1	2,215.51	4.77*
Error (b)	38	464.42	
Within Subjects	40		
Rewards	1	825.61	19.11***
Tasks	1	9.11	.21
Error (w)	38	43.20	

* $p < .05$.*** $p < .001$.

DISCUSSION

In a convincing manner the results of these experiments in general support the delay of reinforcement studies performed at the infrahuman level and the Lipsitt and Castaneda experiment with children. In both experiments herein reported the *Ss* learned more effectively when given an immediate reward than when rewarded following a 7-sec. delay. Contrary to the results obtained by Lipsitt and Castaneda, however, the *Ss* of the present studies did not show a significant preference at the end of the experiment for the stimulus set with which immediate reward had been associated. In view of the fact that the *Ss* of the Lipsitt and Castaneda experiment received 60 trials, it would appear that in the present study the number of trials was insufficient to create a substantial difference in *Ss*' preferences. It appears then that preference measures are less sensitive to the time of delay of reward or are determined by more random variables in the past history of the *Ss* than are the acquisition measures.

The interaction which was found in experiment II deserves some consideration. An examination of Table 1 reveals that, in experiment II, *Ss* learned the size task more quickly under the immediate reward than under the delayed reward, but that the reverse of this was true with the form task. Two observations seem crucial here. First of all, the *Ss* of group II generally were more adept at learning both tasks than those of group I, so that it is possible that the effects of the delayed reward on group II when learning the form task were mitigated by this factor. The mean number of trials for both tasks for group II was 14.3 while that of group I was 24.8 ($p < .01$). The second observation of seemingly considerable importance in interpreting this interaction is that, while the difference between the size-immediate and the size-delay treatment combinations is significant at the 1 per cent level in the predicted direction, the form-immediate and the form-delay difference is nonsignificant. In other words, with respect to neither of the tasks learned in the two experiments was learning quicker under the delay condition. For these reasons the significant interaction of experiment II seems rather unimportant.

The question of why an immediate reward should result in more efficient discrimination learning than a delayed reward must be dealt with. Is the associative (H) factor being effected by the time interval between response and reinforcement, or is it the incentive (K) factor? There are suggestions, however casual, that perhaps both H and K are being effected by this time interval. *Ss* apparently responded more quickly, i.e., made their choice and pressed the button more rapidly, when learning under the immediate reward than when learning under the delayed condition, a fact which suggests that *Ss* were more certain of their choice being the correct one when rewarded immediately. On the other hand, the incentive (K) factor apparently was operating also in that *Ss* seemed to lose interest more readily when learning under the delay condition. The loss of interest referred

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to consisted of Ss gazing about the room, asking random questions, fidgeting, and exhibiting in general a decreased vigor of button-pushing responses. Research designed to test these ideas is currently in progress.

SUMMARY

This paper reports the relative effects of a delayed reward and an immediate reward (light flash) in two experiments involving size and form discrimination learning problems. Forty Ss, kindergartners and first graders, were used in each experiment. In both experiments, Ss learned significantly more quickly when rewarded immediately following correct responses than when rewarded following a delay of seven seconds. There were no task differences. It is believed that both associative and incentive factors played a role in determining speed of learning.

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